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INDIAN AGRICULTURAL
RESEARCH INSTITUTE, NEW DELHI

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THE JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND

INCLUDING

THE FARMER'S GUIDE TO AGRICULTURAL RESEARCH

IMP.

VOLUME 97

(BEING THE NINETY-SEVENTH VOLUME ISSUED SINCE THE FIRST PUBLICATION OF THE JOURNAL IN 1839)

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THE JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND

HOUSING THE AGRICULTURAL WORKER.

I. THE HOUSING SHORTAGE.
II. THE NEED FOR RECONDITIONING.
III. THE HOUSING (RURAL WORKERS) ACT.
IV. PROGRESS MADE UNDER THE ACT.
V. THE ECONOMIC ASPECT OF RECONDITIONING AS IT AFFECTS :—
  (1) The Landowner.
  (2) The Owner-Occupier.
  (3) The Cottage Owner.
  (4) The Cottage Tenant.
  (5) The Local Authority.
  (6) Unemployment.
VI. CONVERSION SCHEMES.
VII. COTTAGES OF ARCHITECTURAL INTEREST.
VIII. BUILDING REQUIREMENTS.
IX. THE FUTURE OF RECONDITIONING.

I.—THE HOUSING SHORTAGE.

THE problem of securing a sufficient supply of houses in Rural Districts to let at rents within the means of agricultural workers has engaged the attention of successive Parliaments ever since the passing of the first post-War Housing Act in 1919.

The housing shortage in country districts at that time was no less acute than in the towns. Countless numbers of agricultural cottages had been for many years falling into disrepair, mainly because of the heavy cost of upkeep and the inability of the farm worker to pay an economic rent.

In many districts Medical Officers of Health, carrying out their statutory duties, made representations to their Councils that numbers of houses in the occupation of agricultural workers were unfit for human habitation. Subsequent reinspections disclosed little, if any, real improvement. Here and there a closing order was made, but the District Councils failed in the great majority of cases to persuade or compel owners to put the cottages into proper repair. The result was either that the houses fell to the ground or that the tenants continued to live under conditions that were a discredit to the owners and to the Housing Authorities alike.

It was inevitable that the housing shortage should have its effect upon the rural population. Many agricultural workers, who were compelled to leave their houses owing to disrepair, drifted to the towns and joined in the already severe competition for council houses provided by the borough and urban authorities, thus helping to intensify the problem of overcrowding in the urban areas.

II.—The Need for Reconditioning.

Generous subsidies for the provision of new houses were provided for by the Housing Acts of 1919, 1923 and 1924, and a considerable number of dwellings were erected in the rural districts with Government aid. It was found, however, that the cost of building, coupled with the high rate of interest on loans, made it impossible for Local Authorities to let the dwellings at rents within the means of agricultural workers, and the number of cottages falling out of occupation always exceeded the supply of new ones erected to take their place.

This state of affairs, well-known to the responsible departments at Whitehall, called for new treatment of the subject, and towards the end of 1926 the Housing (Rural Workers) Act was passed. The object of this Act was to secure a contribution to the improvement of housing conditions for agricultural labourers and other country workers by facilitating the reconditioning of old houses in such a way as to bring them up to modern standards of comfort and sanitation, and by the conversion into dwellings of buildings not previously used for that purpose. It sought to "stop the rot" that had set in among the homes of the country workers.

III.—The Rural Workers Act.

The following is a brief outline of the main provisions of the Act of 1926 :—

1. Financial assistance by way of grant for :—
    - (*a*) The improvement of existing dwelling accommodation.
    - (*b*) The conversion into dwellings of buildings not previously used for that purpose.

2. Assistance is available for :—
   - (*a*) Structural alterations, demolition and rebuilding of walls, chimneys or other parts; the raising of roofs; the renewing of roof timbers ; provision of new roofs ; provision of rain water gutters and pipes ; provision of damp-courses ; enlargement of windows or provision of extra ones, etc.
   - (*b*) Structural additions ; the improvement of existing accommodation by providing more adequate air space or headroom ; construction of bedrooms, a scullery or washhouse, food larder, fuel store, etc.
   - (*c*) The provision or improvement of water supply, drainage or sanitary conveniences and other like works.
3. Assistance is *not* available :—
   - (*a*) For ordinary repairs and upkeep, except so far as this is incidental to the items mentioned above.
   - (*b*) Where the value of the dwelling after the work has been completed, as estimated by the Local Authority, will exceed £400.
   - (*c*) Where the value of the proposed work is less than £50.
   - (*d*) Where the interest of the applicant is a leasehold interest with not more than 30 years unexpired.
4. Assistance can be given by way of grant or by loan or both. The amount of grant cannot be more than £100 in respect of each dwelling, nor can it be more than two-thirds of the estimated cost of the work.
5. When assistance is given by loan it will not exceed either the owner's share of the cost of the work, or nine-tenths of the value of the dwelling when the work is done—the loan to be secured on a mortgage repayable over a period of twenty years (or earlier by arrangement).
6. The following conditions apply for a period of twenty years after payment of grant, and if they are not complied with, the grant must be repaid at compound interest :—
   - (*a*) The dwelling must be occupied by a person (whether as owner or tenant) whose income is such that he would not ordinarily pay a rent in excess of that paid by agricultural workers in the district.
   - (*b*) The rent must not be more than the ordinary agricultural rent or the average rent paid during the previous five years, plus 3 per cent.[1] on that part of the cost of the works not covered by grant.

---

[1] 4 per cent. in respect of dwellings completed after January 1st, 1935

(*Note.*—There is no objection to the sale of any dwellings in respect of which grant has been given, but the conditions, being attached to the dwelling itself, remain applicable for the twenty years, whether or not the dwelling changes hands in the meantime.)

7. The work must not be commenced until the written approval of the Local Authority is given thereto.

IV.—Progress to Date.

The Act received Royal Assent in December, 1926, but up till 1931 progress, except in one or two counties, was very slow. The Act has been twice extended, however, and during the past two years there have been signs that its advantages are becoming more generally known.

Up till March 31st, 1936, some 10,256 cottages had been reconditioned. The Local Authorities for purposes of the Act, in most counties, are the County Councils. In other counties the Act is operated by the Rural District Councils, and in a few instances County and Rural District Councils are responsible jointly. The following tables give the figures in detail :—

I. Counties where County Councils are the Local Authorities for the Purposes of the Acts.

County.	No. of dwellings reconditioned.	County.	No. of dwellings reconditioned.
Bedford	—	Rutland	44
Chester	157	Southampton	516
Cumberland	586	Stafford	84
Devon	1,446	Suffolk East	784
Dorset	156	Suffolk West	39
Isle of Ely	16	Surrey	27
Essex	618	Sussex East	85
Huntingdon	51	Sussex West	70
Kent	150	Westmorland	37
Lancaster	22	Wilts	410
Leicester	38	Worcester	386
Lincoln (Holland)	—	Yorks, East Riding	24
Northampton	133	Yorks, North Riding	153
Nottingham	161	Yorks, West Riding	75
Oxford	326		
Total	6,594		

II. Counties where the Rural District Councils are the Local Authorities for the Purposes of the Acts.

County.	No. of dwellings reconditioned.	County.	No. of dwellings reconditioned.
Berkshire	206	Lincoln (Kesteven)	221
Buckinghamshire	44	Norfolk	478
Cambridge	110	Northumberland	180
Cornwall	514	Peterborough, Soke of	4
Durham	230	Shropshire	615
Hereford	148	Warwick	139
Hertford	23	Isle of Wight	—
Total	2,912		

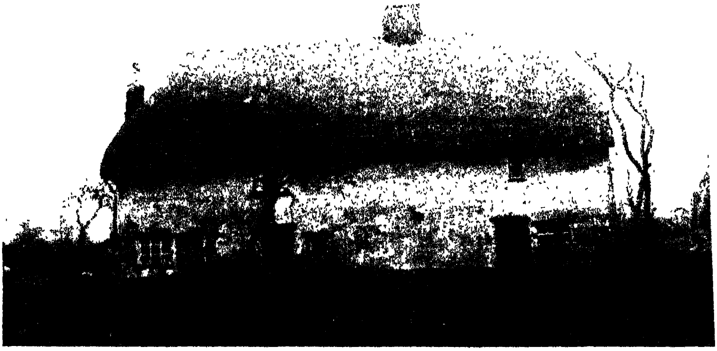


FIG. 1.

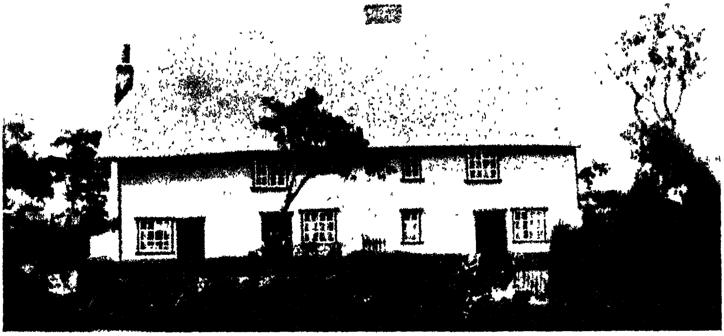


FIG. 2.

Pair of Cottages before and after reconditioning at a cost of £220 each.

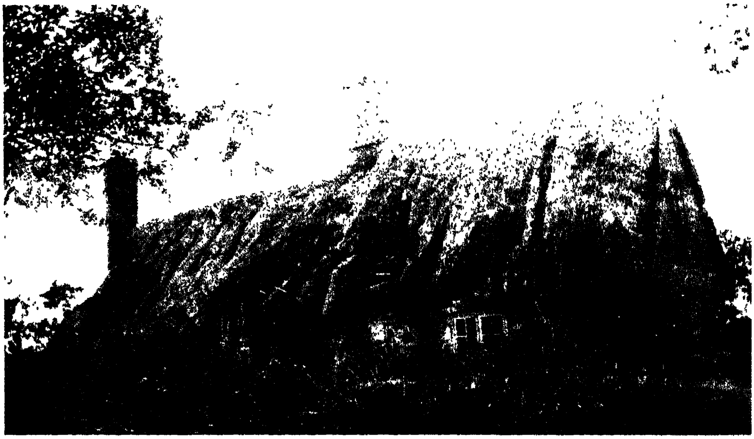


Fig. 3.

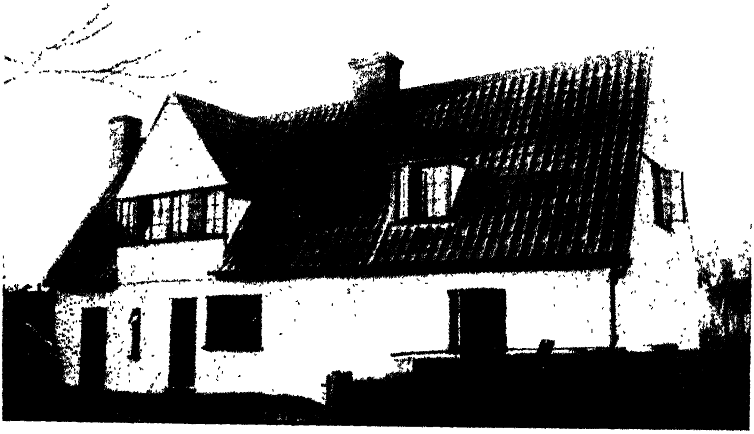
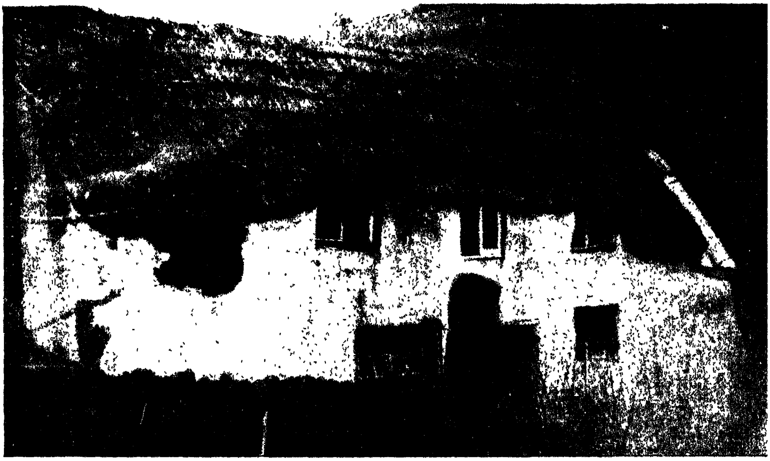


Fig. 4.

Cottage before and after reconditioning—Cost £200.



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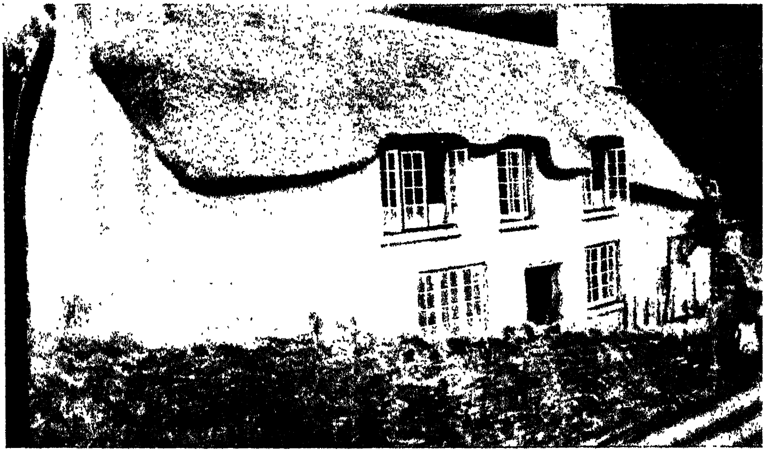

Fig. 6.

Another example in reconditioning.

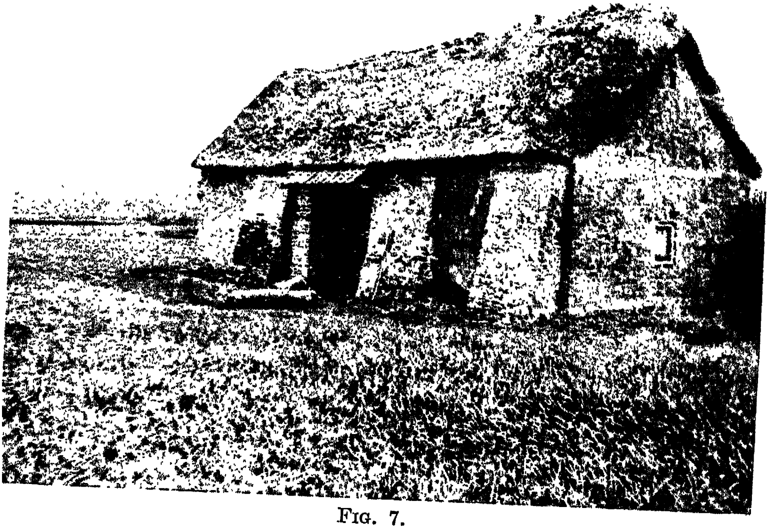

Fig. 7.

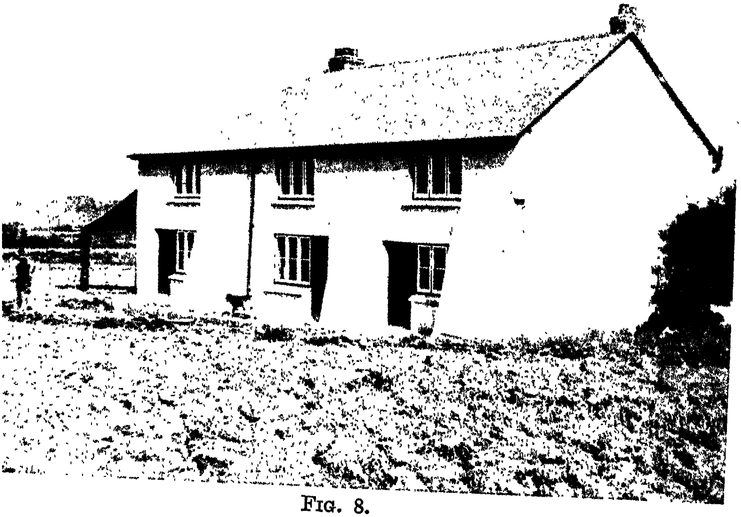

Fig. 8.

An example of conversion.

III. COUNTIES WHERE THE ACTS ARE ADMINISTERED BY BOTH THE COUNTY AND THE RURAL DISTRICT COUNCILS.

	Number of dwellings reconditioned.		
	County Council.	Rural District Council.	Total.
Derby	27	7	34
Gloucester	43	96	139
Lincoln (Lindsey)	127	134	261
Somerset	306	10	316
		Total .	750

Grand Total . . 10,256

It will be observed that the greatest amount of reconditioning has been undertaken in the County of Devon (1,446 dwellings) where the Act is operated by the County Council. Close co-operation is maintained, however, with the Rural District Councils, whose officers assist owners in the preparation of their individual schemes and generally supervise the works during progress on behalf of the County Council.

The record of the East Suffolk County Council (784 dwellings) is relatively as good, the rural population of this area being about one half that of Devon. The accompanying illustrations numbered 1 to 6 show the type of work carried out in these two counties under the Act.

V.—THE ECONOMIC ASPECT OF RECONDITIONING.

Taking the country as a whole, the average cost of reconditioning is somewhere in the region of £200 per dwelling. A grant of £100 is made towards this sum, but at the same time it may be difficult at first for an owner to appreciate what advantages he is likely to reap for such a large outlay.

It must be realized, however, that young workers are no longer willing to put up with what was thought by their fathers and grandfathers to be good enough, and if young men are to be attracted to work on the land, improved housing conditions are essential.

1. *The Landowner.*—The large landowner or estate owner who lets his cottages with the farm gets no immediate pecuniary return, but workers are still needed to till the soil, and it must be patent that farms equipped with good cottages will always be in greater demand than those with poor cottages or with no cottages at all.

2. *The Owner-Occupier.*—The farmer, faced with low prices for his produce, and, at the same time, precluded by the Agricultural Wages Act from keeping back more than 3*s.* per week or thereabouts from his workers' wages for rent and rates, may also be pardoned for thinking twice before embarking upon

an expenditure of £100 per cottage, out of his own pocket, for reconditioning. Experience has shown, however, that in a large number of cases the decision to take advantage of the Act has more than repaid him.

Many instances come to mind, in particular that of a South Devon farmer who, before the Act was passed, had to rent a cottage for his workman, but was unable to keep a good man for any length of time because the cottage was small, dark and unhealthy. After the Act was passed, he purchased the cottage, added a new wing with an additional room downstairs and a bedroom over, 12 × 12 feet, provided a new roof and new floors, new and larger windows, concrete paths and so on, at a cost of £200. The grant was £100 and the farmer paid the balance. There was no difficulty in getting a young farm worker to take the reconditioned cottage, which had been made as good as new. The same workman has been in occupation for nine years, and is rearing up a healthy family of children.

Often there is difficulty in finding the balance of about £100, but the Act provides that this can be borrowed from the Local Authority at a low rate of interest, repayable by instalments over a period of not more than twenty years.

3. *The Cottage Owner.*—From a purely financial point of view, the greatest advantages under the Act are obtainable by the cottage owner where the dwellings are not let to his employees, the rent of such cottages not being controlled by the Agricultural Wages Acts.

In these cases the landlord is entitled to increase the rent by 4 per cent. on his part of the outlay, so that the sum of £100 (net) invested in cottage repairs brings in a very fair return. Should he have to resort to a loan, the owner can borrow the balance from the Local Authority and meet the expenditure in the following way :—

	£	*s.*	*d.*
Cost of Scheme	200	0	0
Amount of Grant	100	0	0
Increase of Rent permitted per annum	4	0	0
Interest on Loan (£100), per annum	3	10	0
Repayment of Principal, per annum	3	10	0

The mortgage deed is usually prepared without charge by the Local Authority.

4. *The Cottage Tenant.*—The tenants of reconditioned dwellings are naturally delighted with the improvements in cases where they are not called upon to pay any extra rent. In other cases it has been found that tenants are only too glad to pay the small addition allowed by the Act in order to secure standards of housing, comfort and amenity which are common to the average town dwelling.

5. *The Local Authority.*—From a public health point of view the advantages are incalculable. The better housing conditions, including a water-tight roof, larger and lighter rooms, properly ventilated bedrooms, pure water supply, proper drainage, and the provision of a larder and foodstore must have a tremendously beneficial effect on the general health of the rural worker and his family. Local Authorities are often called upon to provide accommodation in hospitals and institutions for cases of illness, confinements, etc., where, if the housing conditions had been satisfactory, the patients could have received treatment in their own homes. In course of time reconditioning should result in a definite saving of public money under this head.

Further there must be set off, against the Authority's contribution, the amount of rates they receive from a good dwelling as compared with a derelict one.

6. *Unemployment.*—The reconditioning of some 10,000 houses has resulted in the spending of over £2,000,000 and this must necessarily have done a great deal to relieve unemployment in the rural areas, with a consequent saving to the Authorities in unemployment pay and public assistance grants.

VI.—CONVERSIONS.

The Act has materially helped to solve the shortage of accommodation in isolated country districts by giving grants towards the conversion into dwellings of premises not previously used for housing purposes.

In East Suffolk, existing coach houses, stables and barns have been converted into dwellings, whilst on the Suffolk coast there can be seen, in the place of an old dilapidated cowshed, a five-roomed bungalow which makes an ideal home for a rural worker, being much superior in design and accommodation to many now being erected on new seaside estates.

Again in the rural district of Atcham in Shropshire, where the Act has been very successfully operated by the Rural District Council, there are many instances of ingenious conversions. A tithe barn has been converted into two charming residences, a stable into a house, and a single cottage, with the aid of additions at each end, into two commodious cottages.

The illustrations numbered 7 and 8 show a thatched barn in Devon converted into three dwellings of good size and appointments. In this county, too, may be seen a number of interesting conversions, including several stone built barns converted into cottages, and a disused village school into a house. In other cases disused village chapels have made excellent subjects for conversion, providing accommodation exactly where it was needed in the village centres. Approximately 150 new dwellings have been provided in Devon by these methods.

VII.—COTTAGES OF ARCHITECTURAL INTEREST.

Every endeavour is made by the Local Authority to see that reconditioning is carried out in such a way as not to destroy the special character of the dwellings, and requirements are invariably included in individual schemes to ensure that this desirable result shall be attained.

The illustrations numbered 1 to 6 of improvements, typical of many carried out under the Act, show that both owners and Local Authorities are alive to the importance of preserving the pleasing features of the dwellings.

A tour of the counties where a considerable amount of reconditioning has taken place will show quite forcibly how many 16th and 17th century cottages, which characterize the countryside and enhance its rural beauty, can, by means of the Housing (Rural Workers) Act, be converted into modern dwellings and yet lose none of their external charm and beauty.

In this respect one may recall that in his appeal some years ago for the preservation of ancient cottages, the Prime Minister (the Rt. Hon. Stanley Baldwin, M.P.) observed that "nothing is more characteristic of England's countryside than the cottage homes which, for century upon century, have sheltered her sturdy sons of toil. . . . Ought we not then to be proud of them, to protect them, to do everything in our power to save them from decay ? "

VIII.—BUILDING REQUIREMENTS.

Where a grant of public money is involved the standard of amenity required is rightly higher than that which is necessary to comply with repair notices served on the owner by the Local Authority under the General Housing Acts.

Local Authorities administering the Rural Workers Act generally lay down certain requirements which should be common to all cases. Special circumstances naturally call for relaxation in some particulars, and these circumstances, if represented, receive sympathetic consideration ; but the following requirements, taken from schemes in operation in certain of the larger counties, may be considered to be fairly general in most parts of the country.

Plans.—Applicants are advised wherever possible to employ a qualified architect to prepare proper plans and elevations, specifications and estimates. These are essential if adequate and prompt consideration is to be given to the scheme by the Local Authority.

Bedrooms.—Wherever possible a third bedroom is asked for, but in certain cases this requirement is waived where an undertaking is given that the cottage shall be let to an old couple or to a single man or woman. One bedroom at least must have a fireplace. Windows must be so situated as to give the maximum of light and ventilation.

Staircases.—Where structurally possible a small window, to light the staircases, must be provided. Staircases must be reconstructed, where necessary, in more convenient positions.

Food Storage.—Each house is required to have a properly lighted and ventilated food store, the window-opening to be protected with fly gauze.

Washhouse.—Proper washhouse accommodation and a furnace pan to be provided for each house.

Walls, etc.—Where there is evidence of the absence of a damp course in existing walls, external protection must be provided by means of a waterproof cement plinth, and a similar dado set with lime plaster internally, of the requisite height. If the nature of the ground makes it necessary, a band of impervious paving must be carried round the house.

If the floor line is below the external ground, the surrounding earth must be excavated to a depth of 6 inches below the floor line. Where this involves a sunken area, the banks must be sloped back to allow free circulation of air and the area must be paved and drained.

Eaves Gutters.—Eaves gutters and down pipes must be provided to all dripping eaves, except that, in the case of thatched eaves, a concrete channel must be formed at the base of the walls, wide enough to receive the drip; provision must be made for draining off water. A deep waterproof cement plinth must also be provided as a protection against the splash of dripping water.

Pavings.—There must be suitable paving around all external doors and, where necessary, paved approach paths are to be provided. Internal concrete floors must be laid on a bed of broken stone in order to avoid the condensation of water.

Roofs.—The stripping of tiles or slates or thatch from dilapidated roofs is required, and walls must be raised, where necessary, to give increased height to ground and first-floor rooms. Slates must be laid to a 4 inch lap. Where tiles are relaid, roofing felt is required to be laid underneath.

W.C's. and E.C's.—A separate water closet or earth closet, properly lighted and ventilated, must be provided for each house. If an earth closet is provided, it must be entered from out-doors, have concrete floors, and there must be sufficient garden space for satisfactory disposal arrangements.

Water Supply, etc.—Each house must have a satisfactory and convenient supply of pure water. New wells are to be sunk where necessary. The tops of wells must be covered with concrete, and the well rendered safe from danger of surface pollution. A washing-up sink and draining board is required to be provided for each house. Drainage must be carried out to the satisfaction of the Local Sanitary Authority.

IX.—The Future of Reconditioning.

It is reckoned that the number of cottages so far reconditioned, viz., 10,256, has provided accommodation for between 35,000 and 45,000 persons. Whilst this represents no small gain to agriculture in increased contentment and efficiency, it is readily apparent, when one is travelling through country villages and hamlets, that a considerable amount of further improvement in cottage property is essential before the standard of village housing reaches the level of that in the towns.

The present Chancellor of the Exchequer (the Rt. Hon. A. Neville Chamberlain, M.P.), who was the Minister responsible for piloting the Rural Workers Act of 1926 through Parliament (during his term of office as Minister of Health) stated in 1931, after the Act had been extended for a further period of five years, that " there is general agreement that a fuller use of our agricultural resources must play a large part in the recovery of the country's prosperity, and that, side by side with the development of those resources, substantial improvement must be made in the adequacy and quality of the housing accommodation provided for the worker on the land. It would be idle to claim that housing in the country districts is all that it should be. We know quite well that this is not so. There is much overcrowding and many families are living in cottages which are without proper sanitary conveniences or are in urgent need of repair."

That vigorous action is still needed, some five years after this pronouncement, to rid the country districts of tumble-down, insanitary property is evident from the following reports—the first by a Medical Officer of Health published recently in a West Country newspaper, and the second by a Medical Officer of Health published in June, 1936, after a housing survey undertaken in one of the Midland Counties :—

(1) (*West Country*) :—

> " The village can best be described as a slum. I find it impossible to describe adequately in words the primitive squalor that obtains.
>
> " The housing conditions beggar description. Out of fourteen working-class houses inspected, ten are beyond repair and are not only dangers to health but to life. They ought to be closed and demolished without delay, as they are liable to collapse at any moment."

"It was only fair to add," the report continued, " that the occupants of the houses were not to blame, as they kept their homes beautifully clean under distressing circumstances."

(2) (*Midlands*) :—

> " This picturesque little village has thirty-three working-class houses which are unfit for human habitation ; those which are habitable could be counted on the fingers of one hand. There are no water closets and a number of disgusting privies survive. No drainage system exists ; slops and rubbish, together with excrement, have to be emptied on garden patches close to the shallow unsteined wells. The water is clear and sparkling. . . .
>
> " Nearly all the cottages are seriously damp and some are dripping wet. Washhouses and barns are few in number and mostly ruinous. Lean-to sculleries have forgotten how to lean . . ."

And so on. Probably it would not be possible or advisable for many of the dwellings mentioned in the above reports to be reconditioned. Local Authorities are specially directed to reject applications for grants under the Rural Workers Act where, owing to closeness or bad arrangement, or condition of the streets or buildings in the immediate neighbourhood, the premises cannot be converted into dwellings which will be satisfactory in all respects ; nor, of course, will they entertain applications where the premises themselves are not capable of being made fit for human habitation.

In such cases it is the duty of the Local Authority to secure demolition of the alleged dwellings under the " Slum Clearance " Act of 1930, and rehouse the tenants elsewhere. Exchequer grants are available to Local Authorities towards the cost of slum clearance, the amount in agricultural parishes being an annual contribution of £2 10*s*. per displaced person for a period of forty years.

Government grants of from £2 to £8 per house annually for forty years can be obtained by Local Authorities towards the cost of building new houses necessary to abate overcrowding among members of the agricultural population in a rural district.

A fresh impetus has been given to reconditioning by the provisions of the Housing Act of 1935 which will enable Local Authorities to buy up cottages from owners who, for various reasons, are unable to keep them in proper repair, and themselves obtain the Exchequer grant towards the cost of improvements. It is also anticipated that when the new measures for abating overcrowding are put into force the scheme may be found useful, more particularly in outlying rural districts where new dwellings may not be needed, in facilitating the enlargement of cottages which might otherwise be found too small for a family of normal size.

Reference has been made to the work that has already been accomplished in two county districts, Devon and East Suffolk, where new or improved accommodation has been provided under the Rural Workers Act for nearly 9,000 persons, and where, before the Act expires on June 24th, 1938, a further 3,000 persons at least will be similarly rehoused.

These two areas contain approximately 4 per cent. of the rural population of England and Wales, and in the event of action being taken on a similar scale in other parts of the country, the housing conditions of some 300,000 rural dwellers would be brought up to a satisfactory level.

From this point of view alone the Rural Workers Act will have been worth while.

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R. T. Shears.

Devon County Council Office,
The Castle,
Exeter.

LABOUR, POWER AND EQUIPMENT IN ARABLE FARMING.

> "The Implements which mankind have employed in the cultivation of the earth, and their gradual improvement, is a theme closely interwoven with the history of agriculture."—J. A. Ransome. (1843).

I.—Introduction.

The excuse which the authors offer for writing this article is the extreme poverty of factual information concerning the application of power and machinery to agriculture. It is generally realized that power and equipment costs constitute an increasing proportion of total farm production costs, and that these costs vary widely from farm to farm. But except in the case of a few special farms which employ spectacular or experimental equipment, there is little information concerning the kind of appliances with which the "typical" farm is equipped, or the effects of the use of various items of equipment upon one another, and upon the general farming organization. The object of this article is to bring forward some facts upon this subject, and it is hoped that these facts will assist in making clear some of the considerations involved in the application of power and machinery to the farming systems of England.

Since the days of the earliest philosophers "man's chief end" has been defined in numerous, and often divergent terms. But however much controversies may have raged round questions of ethics, there can be little doubt that one common objective has been to produce the maximum of material comforts with the minimum of human effort. The use of reindeer antlers as an aid in soil cultivation was no doubt as remarkable an innovation in its time as is the modern application of internal combustion engines. The success of both is measured by the consequent increase in man's productive power, and by the fact that this increase enables him to obtain his necessities with less effort, thus releasing energy to create and to consume an ever widening range of luxuries in which leisure must be given a prominent place. Let it be understood, then, that the "mechanization" of farming is not a 20th Century phenomenon, but that the coming of the internal combustion engine in recent years has merely accelerated the pace of development. This age-long process of improving mechanical aids in farming is likely to continue, and should logically result in relatively diminishing employment in agriculture, and a narrowing of the differential between rural and urban incomes.

An American journal, in 1894, contained the statement that "it is doubtful if the next century will see any new important inventions that will further eliminate the man from the land." It is safe to say that developments since 1894 have wholly disproved this forecast, and it is not necessarily fantastic to suggest that we are only now at the beginning of the "machine age" in agriculture. Perhaps the main scope for progress in the future is the application of machines to the heavier and more tedious manual operations, and such developments should have a social as well as an economic value. But it may be said in general that the main *problem* of the agricultural engineer will be to devise means by which the advantages of mechanization can be applied to the ordinary every-day operations involved in the systems of mixed husbandry, practised on the small and medium-sized farms which represent the majority of agricultural holdings in Europe.

II.—Development of the use of Power and Machinery in England and Wales.

Agricultural production is largely carried out by the application of power. With hand implements the labourer furnishes the power as well as the direction. With horses and engines the operator cares for and directs the source of power. Machines are being increasingly used in agriculture to displace human power, and the labourer is becoming more and more a director rather than a source of power.

The increase in the use of mechanical power in English agriculture is illustrated in Table I.

TABLE I.

Acreage under Crops and Grass and Numbers of Horses and Engines on Farms in England and Wales.

	1908	1913	1925	1931
Acreage under Crops and Grass	27,348,000	27,129,382	25,755,000	25,283,000
Horses for agricultural purposes[1]	963,536	807,316	733,200	666,538
Engines, viz :—				
Fixed or Portable :				
Steam	8,690	7,719	3,731	2,246
Gas	921	1,287	1,125	645
Oil or petrol	6,911	16,284	56,744	65,725
Electric	146	262	700	2,475
Wind	?	3,663	990	1,079
Water			3,543	3,210
Others	663	28	21	76
Motor Tractors :				
For field operations	—	—	14,565	16,188
For stationary work	—	—	2,116	2,466

[1] Excluding stallions and unbroken horses ; including mares used for breeding.

The outstanding feature of these figures is the rapid increase in the number of internal combustion engines. The number of fixed or portable oil and petrol engines rose from about 7,000 in 1908 to nearly 70,000 in 1931. Tractors, which did not appear in the 1913 census, number nearly 20,000 in 1931. On the basis of the number of tractors in use in 1931[2] and supposing that the average length of life of a tractor is 7 years, about 3,000 will become derelict per annum. The approximate number of tractors sold in Great Britain since 1931 is shown in Table II. The fact that an average of over 4,000 tractors have been sold in each of the last 5 years suggests that the worn-out tractors are being more than replaced, and that the number in use is steadily increasing.

Along with the increased use of mechanical power, it should be noticed that the number of horses used for agricultural purposes is gradually falling, and that between 1925 and 1934 the number of farm employees in England and Wales, as returned in the Ministry of Agriculture's statistics, declined by about 115,000, or 14 per cent.

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[2] In England and Wales there were 18,654 tractors in use in 1931, and in Scotland there were 2,452, giving a total of 21,106, of which one-seventh is approximately 3,000.

TABLE II.

APPROXIMATE NUMBER OF TRACTORS SOLD IN GREAT BRITAIN.

Year	Home Manufactured	Net Imports	Total
1931	1,200	2,590	3,800
1932	1,500	2,553	4,100
1933	2,200	981	3,200
1934	2,400	1,567	4,000
1935	4,200	2,158	6,400

Generally speaking, the application of power and machinery to British agriculture has not brought about important changes in the farming systems. Rather, there has been a gradual adaptation of new power and machinery to the existing systems, resulting in an increase in the efficiency of man labour. This tendency for the output per worker to be increased can be illustrated by reference to the official statistics of recent years, which demonstrate that the physical output of the agriculture of the country has been rising in spite of a fall in the number of persons employed. For example, according to the most recent *Census of Output*, the volume of the agricultural output of England and Wales was about 4 per cent. higher in 1930–31 than in 1924–25. During the same period the number of employees declined from a total (including casuals) of 806,000 to one of 742,000. Thus a decline of 8 per cent. in employment coincided with an increase of 4 per cent. in output, so that output per worker had apparently risen at least 13 per cent. during these six years. Between 1931 and 1934 a further increase of 14 per cent. in the gross output of farms is recorded (*vide* statement by the Prime Minister in the House of Commons, 2nd April, 1936). Thus it appears that during the ten years 1925–1934 the output of farms increased 18½ per cent., the number of employees decreased 14 per cent. and the output per employee rose by nearly 40 per cent. It should be noted that this calculation does not allow for the fact that there has been a great increase in farmers' dependence on purchased feeding stuffs, consequent on the development of sugar beet growing, the Wheat Act, etc. Further, the number of farmers and farmers' wives (not included as " workers " in the *Statistics*) has not decreased proportionately with the number of employees. But even allowing for these factors it does not seem unreasonable to estimate that during the last ten years the productivity of farm labour has been increasing at the rate of at least 2 per cent. per annum.

The most spectacular aspect of farm mechanization in England is found in the methods employed on a few large specialized corn growing farms, but the most *important* aspect is the gradually increasing application of machine methods to the small mixed farms typical of the country. The application of steam power to agriculture during the first half of last century marked an important advance; from 1850 onwards mechanization gained momentum with the increasing use of reapers, drills, threshing machines, and so on; in post-war years the development of internal combustion engines has increased the flexibility of mechanical power, has made possible its application to many new kinds of agricultural operations, and has brought with it a great increase in the efficiency of agricultural labour.

It may, perhaps, be relevant to mention that in addition to the increased use of standard forms of power and equipment the mechanization of farming is proceeding along many unconventional and opportunist lines. Adaptations and "gadgets" of many sorts, improvised to meet some special need or difficulty, are becoming common-place. Old motor cars are converted to fixed or movable power units for sawing, pumping or field work; home-made hay sweeps, lifting tackle and other equipment or use with existing power units are not uncommon; while contraptions and small improvements, of many and diverse kinds, combine still further to expedite or to save labour. A modern Gray may write:

> "Some village Kelvin who with dauntless art,
> The pretty problems of his farm soon solves
> With old inglorious car, or broken part
> Turned to new service; thus his task resolves."

III.—SOME GENERAL CONSIDERATIONS INVOLVED IN THE PURCHASE AND EMPLOYMENT OF AGRICULTURAL POWER AND MACHINERY.

The cost of machinery and equipment is an important item both in the capital and current outlay of agriculture. For obvious reasons investment in machinery must be kept within reasonable limits. In deciding whether an increase in mechanical plant will justify its initial cost and subsequent upkeep, the following general considerations must be borne in mind.

1. *The Initial Cost.*—Interest on the capital represents an annual charge.

2. *The Life of the Machine.*—A machine eventually wears out or becomes obsolete. The life of different farm machines varies within wide limits; some are worn out in a year or two and some last for half a century. But the useful life of agricultural machinery is frequently ended by obsolescence rather than by wear and tear.

3. *Obsolescence.*—Owing to the rapid improvement in farm machines, and a certain measure of transition from animal to mechanical power, many machines are discarded long before they are worn out. There are few farmers who do not possess

some obsolete hay-making machines, reapers, potato diggers, or other such machinery. A few own machines which have been used for no more than a few days, and which are a constant reminder of the folly of purchasing without due consideration.

4. *Annual Use.*—Farm operations are mostly confined to limited seasons or periods, and the time during which farm machines are in actual use is generally very low compared with that of machines in factories. Thus, in factories to-day, there is a very marked tendency to equip machines with individual electric motor drives instead of using a powerful engine to drive a line of shafting. But on the farm, where the cake-crusher is required for perhaps 50 hours per year, the chaff-cutter for a similar period, and the mill and water pump for perhaps less than 500 hours, it is difficult to justify individual drives, even though this might make for substantial economy in the actual application of the power. Again, many harvesting machines are used for only very short periods, while certain special machines, such as potato sprayers, may be used for only a day or two in the year. On the other hand certain equipment, such as a milking machine, is used twice or perhaps three times a day on every day of the year. The desirability of purchasing a machine often depends primarily on the number of days per year on which it can be productively employed.

5. *Adaptability.*—Ease of adaptability to a variety of operations leads to a full annual use, and thus to efficient operation. For example, the farm cart is one of the most adaptable machines on the farm as it can be used for many kinds of transport. In the case of power, human agents, although undoubtedly the most adaptable form, provide a relatively expensive power unit. The horse is very adaptable as a power unit, in that it can perform most draught operations, either alone or in a team of varying size. The tractor, as a power unit, suffers from the disadvantage that it lacks flexibility—the power of the engine is too great to allow efficient or economical operation on light work. But in other respects the tractor is to-day a very adaptable power unit. In addition to supplying power for draught operations, the power take-off permits the supply of power direct to the mechanism of the machines pulled. Moreover, power is available on the belt for stationary work. Implements which are used with tractors frequently lack adaptability to use with other power units. Thus some power-driven machines may be suitable for use with only one special type of tractor.

6. *Running costs* of various types of power and machinery must be carefully considered, for while the initial cost of most forms of equipment is fairly constant throughout the country, running costs vary widely from farm to farm. Thus the cost of horse labour depends upon many factors in the farming system,

while the running costs of tractors and implements depend upon the use that is made of them and the methods employed for keeping them in good repair. In considering the advantages and disadvantages of using labour-saving machinery, it is important to consider the effect of the use of the machine on the *total* running cost of the farm. Though a certain machine may in theory economize in man and horse power, its use may actually increase the total farm costs unless it applies to one of the peak periods when the demand for labour on the farm is greater than the supply.

7. *Technical Efficiency of Construction and Operation.*—New machines are sometimes put on the market before they have really passed the experimental stage satisfactorily, by firms which have no firmly established reputation to consider. The production of a new farm machine involves a considerable expenditure of time and money in design, testing, production and trial before a satisfactory model can be put on the market. The farmer must sometimes assist in the trial of new machines, but he occasionally tries out a new machine which is hardly worthy of trial, and which he buys with the impression that there is nothing about the machine that can go wrong. This mistake may generally be avoided by dealing with well established firms.

The technical efficiency of farm machines has been steadily improved. A Committee of the *American Society of Agricultural Engineers* has recently prepared a "quality index" for the farm machines of 1932 compared with those of 1914.[1] The factors considered in the analysis included durability, freedom from breakage, efficiency in the use of energy, capacity, operating efficiency and precision, safety, ease and comfort of operation, etc. Compared with a "quality index" figure of 100 for 1914, the following are a few of the figures for 1932 machines: binder and mower, 170; drill, 140; tractor plough, 190; feed grinder, 175; grain thresher, 195; 3-h.p. farm engine, 200, etc. The smallest improvement was in the case of the simple peg-tooth harrow (130), while the index for the silage cutter was 215.

Tractors represent a striking example of the technical improvement of agricultural machinery. Up till about 1920, tractors used in this country were very unreliable. But the modern tractor is no longer likely to break a vital part just when it is most needed. Given reasonable skill and proper care in operation, it is not until late in the life of the modern tractor that breakdowns need be feared.

8. *Efficiency in the Application of Power.*—In comparing the cost of various forms of power we must consider the efficiency with which each can be applied to the operations which it is

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[1] *Rept. Amr. Soc. Agric. Engnrs.* St. Joseph, Michigan (1933).

called upon to perform. Thus, in comparing horses and tractors for draught purposes, it has been shown that the capacity of medium-weight horses over long periods is from 6 to 6·5 horse-power-hours per day, though for short periods they have an enormous "overload" capacity. If, therefore, the tractor could be used to its full drawbar effectiveness, it could displace more horses than are respresented by its drawbar horse-power. In practice, this is anything but true. Tractor drawbar efficiency is generally highest when the tractor is ploughing on firm ground. Under favourable conditions one drawbar horse-power of the tractor is equivalent on an average to 0·75 horses. But in many farm operations, such as transport, harrowing, etc., one drawbar horse-power of the tractor may be equivalent to less than 0·4 horses. On the average, it may be stated that a 10 drawbar horse-power tractor can, so far as the application of power is concerned, displace 5 or 6 horses. In practice, displacement of all these horses very seldom occurs, the average number displaced per tractor being nearer 2 or 3. In any case, it is clear that the displacement of all horses by tractors must inevitably lead to a lowering of the efficiency with which the power of the tractor can be employed.

9. *Improved Performance.*—In addition to the considerations outlined above, the effect of the application of implements or power on crop yields and quality, and on the general productivity of the farm as a whole, must be considered. If work can be done more quickly by the application of power, an increase in the actual cost of working may be more than repaid. Examples of operations to which this consideration frequently applies are the harvesting in good order of clover seed, hay, and barley, and the autumn drilling of corn, particularly on heavy land.

IV.—THE EQUIPMENT OF ARABLE FARMS IN THE EASTERN COUNTIES OF ENGLAND.

1. *Mixed versus Specialized Farming.*—There is an all-too-common misconception that the farming land of the Eastern Counties of England is either already largely devoted to highly mechanized and specialized corn growing, or is eminently suited to such methods. But even the most cursory review of the available statistics, or, better still, a visit to a random sample of farms, will disprove this assumption. Thus in the Cambridge Administrative Province there are about 58,000 agricultural holdings, but in comparison with this figure the number of combine harvesters at work in 1935 did not exceed 20, while it is unlikely that there were half-a-dozen farms on which the sole source of income was grain. On the average more than half the total sales comprise live stock or live stock products. As to the prospects of extending specialized corn growing, it must be

remembered that, of the total number of holdings, less than 6 per cent. are over 300 acres, while probably not more than 1½ per cent. exceed 500 acres (the minimum area advocated for combine work). Further, of the small number of farms over 500 acres, only a proportion are suited to extensive corn growing.

Various reasons militate against a policy of mechanized corn production on specialized lines. First, of course, is the fact that about 98½ per cent. of the holdings are less than 500 acres, while three-quarters are less than 100 acres. A second reason is that experience has shown that the economic advantages of a mixed organization of crops and live stock generally outweigh the advantages of mono-culture.[1] Not only does a mixed organization facilitate an even distribution of labour forces throughout the seasons, but it permits the economic utilization of the by-products from the primary products, is a comparatively cheap method of keeping the land clean and of maintaining soil fertility, and spreads the risk of disease and market fluctuations. Amongst other reasons may be mentioned the fact that the lay-out of fields and farms, the rental value of land, soil variations, market opportunities, and climatic vagaries offer no parallel to prairie conditions. For example, the average size of arable fields in the eastern counties is about 10 acres; the shape of fields is very irregular; soil types vary from field to field.

It is true that the advocates of extreme mechanization, realizing the essential weakness of mono-culture, have in recent years laid increasing emphasis on the importance of diversified organizations comprising *a number* of specialized units. Where a farm is large enough its organization may be diversified, and yet it may reap the advantages of specialization for each, or at least some, of its departments. If it carries sufficient cows, pigs and poultry, a specialist, making use of the most modern equipment and methods, may be in charge of each department; if, in addition, it has more than a certain acreage of cereals, the purchase of a combine may be justifiable. In such cases the economic advantages of both specialization and diversification are obtained. But modern developments in machinery and equipment have greatly increased the minimum size of the economic unit for specialized production, and few farms are large enough and still fewer farmers have both the capital and the ability to secure this dual advantage.

If we exclude from consideration holdings of less than 20 acres (which are subject to rather special qualifications and conditions) the "average" farm in the Eastern Counties is one of about 100–150 acres, producing about twelve different commodities, of which six are cashed directly and the balance used internally for live stock fodder. The principal points of strength in such an organization are : (1) the comparatively level seasonal distribution of labour and equipment requirements, and of income and expenditure throughout the year ; (2) the opportunities provided for using straw, tail corn, animal manure and other by-products ; (3) the ease with which expansion or contraction of individual enterprises may be accomplished to meet price changes ; (4) the spread of risks of either disease or price fluctuations. It may well be that a larger business unit is more economical, but official statistics indicate that since 1913, farms over 150 acres have been decreasing in numbers, while the number of farms of 50–150 acres has been increasing. Here, however, we are concerned with an investigation of the present mechanical equipment of farms in the Eastern Counties of England and not with a study of the optimum size of the farming unit.

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[1] See *J.R.A.S.E.*, Vol. 96: "In Defence of Mixed Husbandry." Carslaw.

2. *Capital Invested in Equipment.*—A survey[1] of farming conditions carried out by the Cambridge Department of Agriculture in 1931–33, and covering 1,000 farms, together with similar data collected from a smaller sample in 1935, provides some useful information on the equipment and staffing common to this arable area. On holdings of 100–150 acres the capital invested in implements, machinery and equipment averaged £235 per farm, or 36*s.* per acre of crops and grass. This investment represents 18·5 per cent. of the total tenant's capital, the other two categories of investment being live stock (39·7 per cent.) and crops (41·8 per cent.) Current expenditure on the maintenance and running of equipment averaged for the same size group £106 per annum, or 17*s.* per acre. This expenditure represented 11·4 per cent. of gross costs. These figures are not, of course, of general application for, as is shown in Table III., there is a definite tendency for capital and cost per acre to vary inversely with the size of the holding. On the smaller farms the investment in dead stock represents a somewhat lower proportion of the total capital than on the larger farms, but this position is reversed in regard to the cost of maintenance as a percentage of gross costs.

3. *Running Costs of Equipment.*—The above figures for annual expenditure on the maintenance and running of equipment and plant represent the sum of ten items of outlay. These items comprise (in order of magnitude) : (1) Purchase of, and repairs to, implements and machinery ; (2) paraffin, petrol and lubricating oil for internal-combustion engines ; (3) hire of tackle for cultivating and threshing ; (4) tax, insurance, repairs and tyres

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[1] *An Economic Survey of Agriculture in the Eastern Counties of England.* Cambridge Univ. (Dept. of Agric.), Farm Econ. Branch *Reports*, 19, 21, 22, and 23.

TABLE III.

CAPITAL INVESTED IN AND RUNNING COSTS OF EQUIPMENT.

(*Average for* 1,000 *farms for each of three years* 1931–33.)

Size of farm (acres)		20–50	50–100	100–150	150–300	300–500	Over 500
Valuation of Imp'ts, Mach'ry and Equipment	Per farm . £	100	150	235	355	575	970
	Per acre . £	2·7	2·0	1·8	1·6	1·5	1·3
	Per cent. of total capital %	20·9	19·3	18·5	17·8	18·0	16·2
Annual maintenance and running costs	Per farm . £	40	66	106	175	265	488
	Per acre . £	1·10	0·90	0·85	0·80	0·70	0·65
	Per cent. of gross costs %	10·5	10·5	11·4	11·6	11·7	12·2

of motor cars and vans ; (5) coal for threshing, steam tackle and sterilizing ; (6) small tools and harness ; (7) poultry huts and pig sheds ; (8) horse-shoeing ; (9) fencing and draining material ; and (10) electricity. It may be objected that some of these ten items should not properly be included amongst equipment costs, but it is difficult to draw a hard and fast distinction in all cases. On certain farms, for example, threshing is done on contract while on others the occupier possesses his own drum. The farmer who does not own a tractor is likely to employ steam tackle. For such reasons it seems only fair to consider tackle hire as part of the equipment costs. Perhaps there is less excuse for including such items as poultry huts, horse-shoeing, fencing and draining material, but as these are comparatively small items the objections may not be sustained. A detailed list of the various items is given in Table IV.

TABLE IV.

ITEMS COMPRISING RUNNING COSTS OF EQUIPMENT IN £ PER FARM.

(*Average for* 1,000 *farms for each of three years,* 1931–33.)

Size of farm (acres)	20–50	50–100	100–150	150–300	300-500	Over 500
	£	£	£	£	£	£
Purchases of and repairs to implements and machinery . .	9·0	16·5	28·4	45·6	69·9	160·0
Paraffin, petrol and oil . .	4·2	8·7	16·4	31·9	54·4	98·4
Tackle hire	7·3	12·2	19·7	31·4	46·6	74·2
Tax, insurance, repairs and tyres of motor cars and vans . .	3·5	7·6	11·3	22·5	35·3	50·0
Coal	4·3	5·9	8·4	12·0	16·0	33·1
Small tools and harness . .	3·3	5·4	8·0	11·2	17·7	35·9
Huts and sheds	4·9	4·5	6·7	9·4	10·6	10·5
Horse-shoeing	2·6	3·9	5·1	7·0	10·3	18·9
Fencing and draining materials .	0·8	1·2	1·9	3·3	4·1	5·4
Electricity	0·2	0·4	0·2	0·5	0·4	1·1

4. *Total Labour and Equipment Costs.*—It may be of interest to make an approximate computation of all labour and equipment costs on those farms. This calculation will involve adding to the equipment costs detailed above, the cost of manual labour (including an allowance at appropriate rates for the *manual* work of the occupier) and an estimate of the maintenance cost of the horses kept for the work of the farm. On holdings of the 100–150 acre group the number of manual workers (including the occupier) averages 4·3 per farm, and the number of work horses 4·2 per farm. The capital value of the work horses is £100 per farm, and their current cost[1] may be estimated at £50 per annum (8*s*. per acre). The labour bill of the farm (including an allowance for the manual work of the occupier) averages £405 or £3·2 per acre. Thus the total current cost of equipment, manual labour and horse labour for farms of 100–150 acres may be estimated at £560 per annum, or £4·5 per acre. These figures again vary with different sizes of farms, and Table V gives the relevant data.

TABLE V.

ANNUAL COSTS OF MANUAL LABOUR, HORSES AND EQUIPMENT.

(*Average for* 1,000 *farms for each of three years*, 1931–33.)

Size of farm (acres)			20-50	50-100	100-150	150-300	300-500	Over 500
No. of work horses	per farm .	No.	1·9	3·0	4·2	5·5	8·2	13·3
	per 100 acres	No.	5·1	4·0	3·4	2·5	2·1	1·7
No. of manual workers	per farm .	No.	2·0	3·1	4·3	6·2	9·3	17·2
	per 100 acres	No.	5·4	4·2	3·4	2·8	2·4	2·3
Total value of horses and equipment	per farm .	£	140	220	335	495	800	1,390
	per acre .	£	3·8	2·9	2·6	2·3	2·1	1·9
Total current cost of manual labour, horses, and equipment	per farm .	£	255	390	560	840	1,265	2,350
	per acre .	£	6·9	5·3	4·5	3·9	3·3	3·1
Per cent. of total current cost represented by	manual labour	%	76·4	74·3	72·1	70·8	70·3	70·2
	horses .	%	8·0	8·7	9·0	8·4	8·8	9·0
	equipment	%	15·6	17·0	18·9	20·8	20·9	20·8

It will be seen that the total cost of all labour and equipment ranges from £6·9 per acre on holdings of 20–50 acres to £3·1 per acre on farms over 500 acres. As a percentage of total labour and equipment costs manual work varies inversely with the size of the holding, while equipment costs vary directly with the size of the farm.

Although the cost per acre of all labour and equipment ranges so widely between the smallest and largest farms, it represents a comparatively constant proportion (about 55 per cent.) of total farm costs in all size groups. This is due to the fact that the intensity of production varies inversely with the size of holding, the value of produce (and total costs) per acre being very much greater on small than on large farms. This fact introduces a point which must be kept prominently in mind when discussing the comparative economy of the application of labour on small and large holdings. The differential in economy is not necessarily as great as might be assumed from data on labour costs expressed on the basis of acreage alone. For example, although the total labour cost per acre on the smallest holdings is more than twice that on the largest farms, the range in production per unit of labour costs is not nearly so wide.

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[1] This does not include blacksmith, already charged under maintenance of equipment, nor manual labour to be charged separately below.

5. *Relation between Output and Labour Costs.*—It is difficult, because of the great range in types and qualities of output, to find a satisfactory single measure of physical production in agriculture. In default of a better index the money value of the production is here used. In computing this value, expenditure on purchased feeding stuffs and expenditure on purchased live stock have been deducted from gross sales, in order to arrive more closely at the value of the material actually produced on the farms. The deduction of purchased feeding stuffs makes much more difference on the small farms than on the large farms, expenditure under this heading amounting to as much as £3 per acre on holdings of 20–50 acres, and less than 15*s*. per acre on farms of more than 500 acres. Table VI gives the gross output figures calculated by this method, and expresses them on a number of different bases.

TABLE VI.

GROSS OUTPUT (1) PER FARM, PER ACRE, AND PER UNIT OF LABOUR COSTS.

(*Average for* 1,000 *farms for each of three years* 1931–33.)

Size of farm (acres)	20-50	50-100	100-150	150-300	300-500	Over 500
	£	£	£	£	£	£
Gross output :—						
per farm	285	480	760	1,175	1,795	3,375
„ acre	7·6	6·5	6·1	5·4	4·7	4·4
„ £100 equipment costs . .	705	725	715	670	675	690
„ £100 horse costs . .	1,380	1,415	1,505	1,650	1,610	1,595
„ £100 man. labour costs .	144	166	187	197	201	204
„ £100 total equip., horse and labour costs . . .	110	123	135	139	142	144

[1] Gross output = gross sales minus purchased live stock and purchased feeding stuffs plus or minus change in valuation plus private drawings in kind.

The last line of the table is, of course, the most interesting in reference to the present article. The output per £100 of total labour and equipment costs increases with size of farm from £110 on the smallest farms to £144 on the largest farms—an increase of 31 per cent. It should be noted, however, that this increase

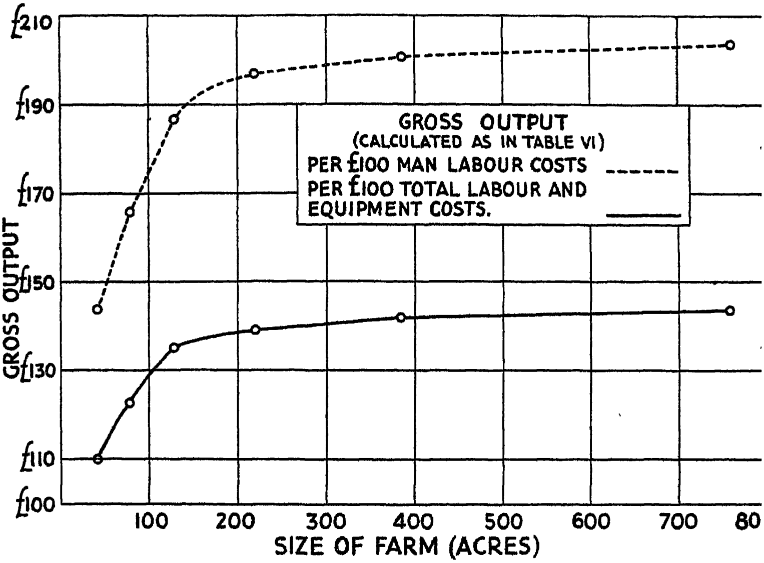

DIAGRAM I.—Gross Output per unit of Labour in relation to size of Farm.

takes place at a *decreasing* rate (see Diagram I), and that the improvement is most pronounced on farms under 150 acres in size, becoming almost negligible on farms above 300 acres. The output per unit of manual labour costs (penultimate line in Table VI.) also shows a pronounced tendency to increase with size of farm, and here the range is greater, varying by 42 per cent. from £144 on holdings of 20–50 acres up to £204 on farms above 500 acres. Again, however, there is a strong indication that the increase takes place at a decreasing rate, and that the improvement is negligible on farms over 300 acres.[1] Output per unit of horse costs also increases with size of farm, but output per unit of equipment costs remains comparatively constant in each size group.

The inference which may be drawn from Table VI is that large farms are able for one reason or another to employ their equipment more efficiently than the small farms, for with a practically constant output per unit of equipment costs there is a marked rise in the output both per unit of horse costs and per unit of man-labour costs, as size of farm increases. In other words, with equal equipment costs per unit of output on large and small farms, the cost of horse and manual labour per unit of production is less on the former. One obvious explanation of this tendency is that the size of the larger farms justifies capital outlay on more effective plant than the small farmer can afford to buy.

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[1] For further discussion on this point, see *Roy. Stat. Jour.*, XCVIII, Pt. IV: "The Labour Bill and Output on Arable Farms." Carslaw & Graves, pp. 616–618.

6.—*Relation between Size of Farm and Labour Costs.*—The annual expense on implements and machinery has been shown to be an important item in the total cost of agricultural production. Both the running costs and the capital value of implements and machinery per 100 acres of crops and grass are higher on the small farms than on the large. This is partly because many implements cannot be fully utilized on the small farms. Diagram II shows the relation between the size of holding and the number of acres of crops and grass per implement on five size groups of farms in the Eastern Counties. This demonstrates that a much greater acreage is operated by a single implement on large than on small farms. The difference in acreage operated per implement or machine is least in the case of two-wheeled carts. Carts are used for transporting many kinds of goods, and are fairly fully employed, even on the smallest farms.

DIAGRAM II

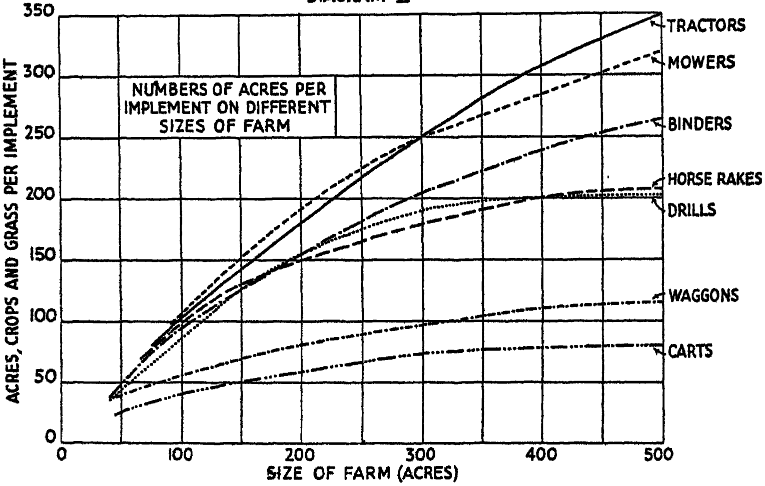

DIAGRAM II.—Acres per Implement in relation to size of Farm.

On the other hand, tractors, mowers, binders, etc., cannot be efficiently employed on the smallest holdings, for the acreage operated is so small that the implement is used for only a few days in the year. It has been shown that the cost per tractor day worked falls appreciably with an increasing number of days use per annum.[1] The same is true of implements like the binder, which have a very limited seasonal use. For example, many farms with less than 20 acres of cereals possess a binder, and yet one binder would be adequate to harvest five or six times as much grain. Again, on farms with tractors, the average number of days' work done per tractor per annum varies from about 30 on holdings of 20–50 acres up to about 130 on farms over 500 acres. Similar illustrations could be drawn for most other common types of equipment.

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[1] See Cambridge University Farm Econ. Branch *Report* 21, p. 72.

Table VII, abstracted from *Report* 19 of the Cambridge Farm Economics Branch, and relating to 1,000 farms in the Eastern Counties in 1931, gives the percentage of farms in different size groups equipped with certain of the more important items of machinery.

TABLE VII.

PERCENTAGE OF FARMS IN DIFFERENT SIZE GROUPS EQUIPPED WITH CERTAIN TYPES OF MACHINES.

(*Averaged on* 1,000 *Eastern Counties' Farms in* 1931.)

Size group	Percentage of farms in different size groups equipped with:					
	Tractor	Motor van	Fixed engine	Threshing machine	Steam tackle	Milking machine
Acres	%	%	%	%	%	%
20– 50	3	2	9	—	—	—
50–100	10	5	27	1	—	1
100–150	23	6	40	2	1	1
150–300	47	10	44	7	1	2
300–500	64	12	44	25	5	4
Over 500	78	27	57	46	14	3

It will be seen that with all categories of equipment the larger farms have an advantage over the smaller farms, and should, in consequence, be in a position to produce more with an equal number of horses and men, or an equal amount with fewer horses and men. But as the cost per unit of work accomplished by equipment is generally related to the amount of work done, the importance of placing a full load on each machine will be obvious, and the handicaps from which small farms suffer on this score must be appreciable in the aggregate. There are other reasons why output per unit of labour costs may be expected to vary as between different size groups; there is, for example, a possible relationship between the type of commodities produced and size of farms, or perhaps an uneven incidence of the Law of Diminishing Returns due to variations in intensity of production per acre. Such matters, however, do not fall within the scope of this article.

7. *The Difference between Available Power and Effective Power.*—The total amount of power available to agriculture has increased, in spite of the fall in the numbers of horses and labourers. The amount of potential power represented by various

machines does not, however, give a true picture of the quantity ot work performed by various types of power. Thus it has been estimated by the United States Department of Agriculture that whereas in 1930 work animals represented only 24 per cent. of the total power available to agriculture in that country, they actually performed 51 per cent. of the total amount of work done on farms in that year. Tractors, which represented 31·2 per cent. of the available sources, supplied only 24 per cent. of the total work done.

Estimates of the position in the Eastern Counties of England in 1932 are given in Table VIII, where the power available in tractors, fixed engines and horses is expressed per 1,000 acres of farmed land, and the amount of work actually performed by each of these forms of power is calculated. These figures are not comparable with the American data quoted above, and which referred to all forms of power.

TABLE VIII.

AMOUNT OF POWER AVAILABLE AND THE AMOUNT OF WORK ACTUALLY DONE PER ANNUM PER 1,000 ACRES OF FARMED LAND IN THE EASTERN COUNTIES.

	Tractors	Fixed Engines	Horses	Total
Available H.P. per 1,000 acres .	26	8	28	62
Per cent. of total available H.P. contributed by each . .	42%	13%	45%	100
H.P. hours of work done annually per 1,000 acres	16,800	2,800	44,600	64,200
H.P. hours of work done per H.P. available	646	350	1,594	1,035
Per cent. of total H.P. hours of work contributed by each .	26%	4%	70%	100%

Thus, though tractors represented 42 per cent. and horses 45 per cent. of the total power available in tractors, horses and stationary engines, the percentage of the total work done was only 26 per cent. by tractors, and as much as 70 per cent. by horses. This helps to illustrate the fact that on most farms horses are still the main source of power, and that the tractor is mainly used to supplement horse work for the heavy duties involved in ploughing, preparing seed beds, harvesting, etc. One of the principal advantages in having a tractor is that it enables heavy work to be done more thoroughly and rapidly in the limited time available for certain operations.

Before leaving Table VIII, attention may be drawn to the discrepancy which exists between the potential number of working hours in a year, and the number of hours actually worked by each of the three sources of power. Assuming that it would be possible to work for 44 hours per week for 52 weeks, then the potential number of working hours for a year is 2,288. Against this we find that tractors work only 646 hours (or 28 per cent. capacity), fixed engines only 350 hours (or 15 per cent. capacity) and horses 1,594 hours (or 70 per cent. capacity). Combining all three forms of power the number of horse-power hours worked represents only 44 per cent. of full capacity. The dependence of farming on climatic conditions is, no doubt, responsible for this very large discrepancy, and in some ways perhaps these calculations are rather meaningless; but the point which seems worth making is that, compared with industry, agriculture has yet far to go in its search for ideal power units.

8. *The Effect of the Tractor on Farm Organization.*—As in recent years the principal evidence of increasing mechanization has been the rise in tractor sales, it may be of interest to try to isolate the effect of tractor work on the farm organization. For this purpose figures for forty-four farms, more or less homogeneous in size and soil, are presented in Table IX. These farms are all between 150–300 acres, and are situated either in central Norfolk or in central Suffolk. The farms have been divided into two groups, viz.: (A) those on which at least 50 days' tractor work

TABLE IX.

A COMPARISON OF ORGANIZATION ON FARMS USING AND NOT USING TRACTORS.

(*Average for 44 Farms of* 150–100 *Acres in central Norfolk and Suffolk for the year* 1933.)

			Average for 17 farms on which at least 50 days' tractor work was performed (A)	Average for 27 farms on which less than 50 days' tractor work was performed (B)
1.	Days tractor work performed	No.	124	10
2.	Size of farm	acres	205	214
3.	Arable area	„	144	143
4.	Area in cash crops	„	89	80
5.	Gross charges	£	1,967	1,627
6.	Purchases of foodstuffs	£	449	295
7.	Purchases of fertilizers	£	70	43
8.	Labour bill	£	644	612
9.	Rent	£	191	185
10.	Capital in live stock	£	801	781
11.	Capital in crops	£	1,244	1,086
12.	Capital in implements and machinery	£	419	299
13.	Working horses	No.	5·4	6·8
14.	Gross Output[1]	£	1,615	1,287
15.	Gross output per £100 labour bill	£	251	210
16.	Profit	£	376	201

[1] Gross output calculated as in Table VI.

was done in the year, and (B) those on which less than 50 days' tractor work was done.

On the farms falling into column (A) of Table IX an average of 124 days' tractor work was done in the year, the corresponding figure for farms in column (B) being only ten days. So far as the size, arable area, and rental of the farms is concerned there is little difference between the two groups, but the profits secured (line 16) are £175 greater on farms using tractors than on those where tractors are seldom employed. How does this substantial difference in profits arise ? Are the increased profits directly due to the tractors, or are they the result of more efficient all-round farming methods, of which the presence of tractors is only one illustration ? A comparison of the other factors enumerated in the table rather suggests that the latter is the more reasonable explanation.

First of all it should be noted that the farmers with tractors do not spend less than those without ; in point of fact, the gross charges (5) incurred by the former average £340 per farm more than those of the latter. The principal reason for this is a much larger expenditure on purchased feeding stuffs (6), made necessary partly because a greater proportion of the farmed land is in " cash crops " (4), and partly because more live stock are carried (10). But the farms with tractors also spend more on fertilizers (7), and although they have fewer horses (13) their labour bill (8) is actually higher. It may reasonably be inferred, then, that the higher profits on the farms with tractors are not due to a reduction of total expenditure, but rather to a greater output.

But it would not be fair to assume that this greater output (14) is due solely to the presence of tractors, for the generally higher level of current expenses on fertilizers, labour, feeding stuffs, etc., must be considered, while it will be noted that there is a larger capital investment in live stock, crops and equipment (lines 10, 11 and 12). There can be no doubt that the frequent use of tractors has made it possible to get round the work more quickly, has flattened out the peak periods of demand for horse and man labour, and has perhaps made it possible to grow and to harvest certain types of crops for which otherwise there would not have been time. The greater area in " cash crops " on the farms with tractors rather substantiates this latter suggestion. There can also be no doubt that a man driving 20 h.p. can be more effective than if he is doing the same operation with only 2 h.p. But the general inference from the figures must be that the higher profits from the farms with tractors are due to a relatively greater all-round intensity of production. From this it may perhaps be hazarded that the purchase of a tractor must generally be justified by an increased output, rather than by a reduction in farm expenses.

SUMMARY.

1. The "mechanization" of farming is not a 20th Century phenomenon, but has been proceeding gradually since the dawn of civilization. The coming of the internal combustion engine in recent years has merely accelerated the pace of development. This age-long process of improving mechanical aids in farming is likely to continue, and should logically result in relatively diminishing employment in agriculture, and a narrowing of the differential between rural and urban incomes.

2. An outstanding feature in the organization of British agriculture in recent years is the increase in the number of internal combustion engines, both fixed and mobile. In spite of a substantial decline in the number of workers and horses employed, the physical output of the industry has been increasing. Between 1925 and 1934 the output per worker appears to have been rising at a rate of at least 2 per cent. per annum.

3. In addition to the increased use of standard forms of power and equipment, mechanization is proceeding along many unconventional and opportunist lines.

4. The considerations involved in the purchase of new equipment are discussed under the headings: (*a*) initial cost, (*b*) length of life, (*c*) obsolescence, (*d*) annual use, (*e*) adaptability, (*f*) running costs, (*g*) efficiency of construction, (*h*) efficiency in application of power and (*i*) efficiency in production. It is emphasized that in weighing the advantages and disadvantages of introducing labour-saving machinery, it is important to consider the probable effect on the farm economy *as a whole*. Though a certain machine may in theory economize in man and horse power, its use will actually decrease the net farm profit, unless it permits *total* farm income to be increased *relative* to total farm costs.

5. The economic advantages of "mixed" farming generally outweigh disadvantages due to absence of "specialization." Systems of mixed farming are predominant in Britain. Only an insignificant fraction of farms are over 500 acres in size, and the great majority of holdings are less than 100 acres.

6. In the eastern arable counties of England the capital value of implements, machinery and equipment averages roughly 40*s*. per acre of crops and grass, and represents nearly 20 per cent. of total tenant's capital. Current expenditure on the maintenance and running of equipment averages about 20*s*. per acre. The total current cost of manual labour, horse labour, and equipment averages 90*s*. per acre. These figures vary inversely with the size of farm.

7. On account of the greater intensity of production on the smaller farms the variation between different sizes of farms in output per unit of labour is not so wide as the range in total

labour and equipment costs per acre. Nevertheless, the value of the output per £100 total labour and equipment costs is nearly one-third greater on farms over 500 acres than on farms of 20–50 acres. The range in output per unit of manual labour is even wider.

8. One advantage secured by the large farms is that each unit of equipment performs a greater amount of work. For example, the average number of days work done per tractor per annum varies from 30 on holdings of 20–50 acres up to 130 on farms of over 500 acres. It is mainly for this reason that large farms can afford to possess the more modern and effective types of equipment.

9. There is a wide gap between "available" and "effective" power. Estimates suggest that at the present time tractors are worked to less than 30 per cent. capacity, fixed engines less than 20 per cent. capacity, and horses about 70 per cent. capacity. Combining these three forms of power, it is estimated that the average number of horse-power hours worked on farms is less than half full capacity. On this basis agriculture has yet far to go in its search for ideal power units.

10. Farms using tractors secure better profits than those depending wholly on horses, but this appears to be due to more efficient all-round methods, of which the presence of tractors is only one illustration. The data suggest that the substitution of tractors for horses must generally be justified by increased output.

11. The obvious and simplest direction for further progress in mechanization is in connection with the heavier and more tedious operations of the farm. More complex, though equally important problems, are to devise means of applying modern sources of power to the ordinary everyday operations of mixed farming on comparatively small units.

R. McG. Carslaw.
C. Culpin.

School of Agriculture,
Cambridge University.
March, 1936.

THE IMPROVEMENT OF HILL GRAZINGS.

THE CAHN HILL EXPERIMENTS.

IN any survey of the actual methods of improvement of hill land it is well to begin by considering some of the wider aspects of the problem as a whole.

The total agricultural area of Great Britain is some 45,000,000 acres, of which one-third is classified as rough and hill grazings; of the remaining two-thirds a considerable part consists of very poor pasture. It is of some significance that a great deal of the land now classified as rough grazings was under cultivation at some time during the last century. In general, portions of the drier hill slopes were cultivated and, after a succession of cereal crops had been taken, were let down again to grass. In places where this has happened, and especially where lime was applied, the hill improver has a much easier problem than that of dealing with previously uncultivated hill land. Thus, for instance, part of the land now in the occupation of the Cahn Hill Improvement Scheme at Knighton, Radnorshire, was ploughed and limed about seventy years ago and a block of land, including the above, was ploughed up and re-seeded in 1934. There was a tremendous difference in the "take" of the better grasses and the wild white clover due to the previous cultivation and liming; and this initial superiority has been maintained right through to the present time. The same effects can be seen on hill land adjoining old homesteads, now in ruins. There used to be a large number of these homesteads, known in Welsh as "hafod," on the Welsh hills. The hafod, like the Scottish shieling and the Norwegian saeter, was the summer residence of the farmer and his family, the migration from the lowland to the highland and back again taking place at fixed dates and the farmer taking all his cattle stock to the hill pastures, in addition to his sheep and horses. On the unenclosed hills the herds of the various farmers were run together, and were collected co-operatively for milking. The milk was converted into salted butter and cheese for winter use. During this summer season the lowland was left devoid of stock, the fields being enclosed with earthen banks and hedges to protect the growing crops, and in due course the farmer and any male members of his family went down to gather in the hay and corn crops. Even now the outlines of the paddocks near these old farms may often be traced by their herbage, which is quite different from that of the adjoining hill; although it has been excessively grazed for generations it still maintains its superiority.

It is important also to realize that the stocking of hill pastures has, within living memory, undergone a complete change. In the days of our fathers the hill farmer looked for his revenue mainly to his four-year-old cattle, his four- and five-year-old wethers, his four- and five-year old cobs and ponies, and to his wool. The modern preference for young and tender meat has upset the old system and, as a result, hardly any cattle are now grazed on the higher hills. The result of this is felt in several ways—long coarse grasses have become dominant, bracken is greatly on the increase because of the lack of trampling and treading by heavy beasts, and the quality of the winter grazing for sheep has deteriorated greatly with the cessation of the hard grazing of the coarse grasses by cattle in summer and the scything of large areas for bog hay for wintering the cattle. With regard to the sheep stock, instead of keeping the wethers until they were four or five years old, many hill farmers have changed their system so completely as to sell all their male lambs at less than six months old. As a result, the entire flock, apart from a few rams, is composed of breeding ewes and young stock and, in consequence, there is a much heavier drain on the mineral constituents of the soil, especially calcium and phosphorus. The effect of this system is that a number of hill farmers are finding it increasingly difficult to rear their former numbers of lambs. Moreover, even if they do turn young cattle on to the hill, these do not grow or thrive. This aspect of the problem will become more and more serious if steps are not taken to rectify it.

In the district where the lands of the Cahn Hill Improvement Scheme are situated, *i.e.*, on the foothills of Plynlimon, it is the custom of the hill farmers to sell the majority of their wether lambs as stores in the autumn and to send away any that remain unsold, together with all the ewe lambs, to a lowland farm for the winter. Numbers of farmers also take summer grazing for their young cattle.

The origin of the Cahn Hill Improvement Scheme can be traced to two factors—firstly, to a survey of the hinterlands of Mid-Wales, made by Professor Stapledon when he first came to Aberystwyth over twenty years ago, and, secondly, to the generosity of Sir Julien Cahn. In the course of his survey, Professor Stapledon became convinced that a tremendous amount of Molinia- and Nardus-dominant hill land was capable of great improvement. In 1927 manuring experiments were first started by Professor Stapledon and the staff of the Welsh Plant Breeding Station, and these were followed later by cultivation and seeding trials. By 1933 the work had reached a stage when it was necessary to test out the results on a large area whose management and stocking would be under complete control. Professor Stapledon's appeal for funds for this purpose was answered by Sir Julien Cahn, and the Cahn Hill Improvement Scheme was established. After exploring a number of possibilities it was finally decided to take a lease of about 3,000 acres on the Hafod Estate near Devil's Bridge, about 15 miles from Aberystwyth. The area in question falls into three well-defined units, namely :—

1. Pwllpeiran, one of the home farms, consisting of 88 acres of fields, 193 acres of hill grazings and 78 acres of woodlands.
2. Prignant and Banc y Bont, consisting of 15 acres of fields, 312 acres of hill grazings and 17·5 acres of woodlands.
3. Nant Rhys, a sheep-walk of 2,200 acres.

In addition to the above, and with a view to conducting trials over a wide range of conditions, a block of land of about 120 acres was leased on the Whitton Hill near Knighton, Radnorshire. Also, 7 acres of land at Ponterwyd, previously leased by the Welsh Plant Breeding Station for experimental purposes, were taken over by the scheme. The elevation of the Knighton land is approximately 1,100 feet above sea-level and the bulk of the Hafod estate is situated between 1,000 and 1,900 feet. Most of the improvement work so far carried out has been done on land ranging between 1,000 and 1,400 feet. Before cultivation the natural herbage on these hills was Nardus (mat grass) and Molinia (flying bent), with small areas of *Agrostis* and Sheep's Fescue. In addition, blocks of heather- and bracken-dominant land have been improved.

Before discussing the various methods of improvement it may be of interest to say something about the selection and lay-out of areas for improvement. In the selection of areas three factors have to be borne in mind—situation, water supply and fencing.

(*a*) *Situation.* In the improvement of hill land, this must be considered in relation to the running of the farm as a whole. The smaller paddocks, especially those where fattening and winter-keep crops are intended to be grown, should be in the most accessible positions. Aspect and shelter should also be taken into account. Shelter, indeed, is very important for wintering, and fences should be so drawn as to give each field an area that is sheltered from prevailing winds.

(*b*) *Water Supply.* As a rule this is not difficult to arrange, there being numbers of springs and streams on the majority of hill farms. It is, however, important, in laying out new blocks, to have a supply of water that will not fail during drought, and therefore, when drawing out plans for fences, the land should be so split up as to include a good water supply in each enclosure.

(*c*) *Fencing.* In the fencing of new blocks considerable economy can be achieved by making use of existing fences and walls to the greatest possible extent. On the Cahn Hill lands it has been possible in several instances to fence a large tract by erecting a single new fence along one side of a square or oblong. In dealing with such cheap land it is of little significance if the fence includes rather a large block containing some areas that cannot practicably be improved. Indeed there is good reason for including such areas, especially if the block is to be used for growing fattening crops. The sheep will often select these unimproved portions as resting places and will thus automatically improve them.

METHODS OF IMPROVEMENT.

There are various methods which can successfully be adopted for the improvement of hill pastures. Probably the best way is to utilize the smaller fenced-in areas nearest the homestead for the growing of fattening crops such as rapes and turnips, together with grasses like Italian ryegrass for winter keep. This, of necessity, involves ploughing. In this connection the advent of the track-laying tractor and the heavy-duty plough has made a tremendous difference in the ease of operation. A Caterpillar Twenty tractor and a Ransome's "Junotrac" plough have proved capable of tackling steep slopes with outcrops of rocks and boulders; in fact this combination has ploughed out of one field alone over 100 tons of boulders, the only breakages being an odd disc or share. The practice on this type of land, under the Cahn Hill Scheme, is to grow fattening crops of rape and turnips, together with Italian ryegrass, for a number of years. The mixture is usually sown about the middle of May, and the crops are used for the fattening of wether lambs during September, October and November. After November the block is rested to allow the Italian ryegrass to recuperate before the winter grazing commences. It is then used for the wintering of lambs or weakly ewes; for this purpose a selected strain of pedigree winter-green timothy, bred at the Welsh Plant Breeding Station, is also used.

Unless there are special circumstances, it may be generally assumed that the further the land lies from the homestead the less intensive should be the cultivation, cropping and manuring. The Cahn Hill Scheme has one convenient block, in a sheltered position, right in the middle of the hill, on which fattening crops and oats are grown, but, generally speaking, the arrangement of cropping is somewhat as follows: the smaller areas nearest the homestead are cropped with fattening crops and Italian ryegrass; the intermediate blocks, between these and the open hill, are generally cultivated, manured and sown down at once with a permanent seeds mixture and are used during winter for in-lamb ewes and in summer for the production of fat lambs.

Cultivation.—This presents a difficult problem to the improver of hill land inasmuch that no special implements have been made for the purpose. The first essential is a track-laying tractor, the ordinary wheeled type being of little use on steep slopes, besides being exceedingly dangerous. The Scheme has tested out a large number of implements of various kinds and, while most of them are excellent for field conditions, very few have proved capable of prolonged service on hill land containing outcrops of rocks and boulders. Before any cultivation is attempted it is advisable, where possible, to burn off the old herbage during a spell of favourable weather. In some cases it has proved possible and advantageous to run a fire twice over an area before cultivation has begun.

Caterpillar 20 Tractor with " Junotrac " Plough.

Cultivations may conveniently be dealt with under three heads, viz. ploughing, rotary cultivation and harrowing.

(*a*) *Ploughing.*—A number of ploughs, of both the disc and mould-board types have been tried, but the only one which has given complete satisfaction is the Ransome's two-furrow " Junotrac." Whilst ploughing may not be the best initial cultivation, it has been found in every case the most suitable preparation for crops intended for fattening and winter keep on the blocks near the homestead. It is especially useful, also, when dealing with bracken-infested land, a good deep ploughing in spring weakening the bracken considerably. On very uneven land, where the ploughing has necessarily been rather rough, the best combination of implements for the subsequent preparation of a seed-bed has proved to be the Ogle spiked roller with a Howard steel flexible harrow coupled behind; this harrow has knobs instead of tines. This outfit has the double advantage of not dragging up the furrows where the ploughing has been rough, and of evening up the surface. The next procedure is the sowing of seeds, which is usually done with a twelve-foot wide broadcast sower drawn by a cob or light horse. An Ogle non-clog spiked chain harrow is generally used for covering the seed and, if at all possible, slagging is done at the same time, the harrow being hitched behind the distributor. Such are the normal cultivations on ploughed land, but, if the surface is still very rough after the spiked roller and harrow have been over it, it is run over with a Cambridge roller and chain harrow before the seed is sown.

(*b*) *Rotary Cultivation.*—The rotary cultivation done under the Scheme has been carried out by two machines, the Austral and the Fishleigh, both driven from the power take-off of the tractor. The Austral has a number of knives, bent at right angles, which cut up the surface into clods of about 6-inch square in size. It is bolted on to the back part of the tractor, forming one unit with it. This arrangement is of considerable advantage when negotiating steep slopes or cultivating soft peaty land. The Fishleigh, on the other hand, is pulled by the tractor on its own wheels and, instead of knives, has numerous tines which tear up the mat and top layer of soil. The tearing action of the numerous tines leaves the surface in a finer state of disintegration and the small fragments are much more easily dealt with than the clods formed by the knives of the Austral.

Fishleigh Cultivator at work.

(*c*) *Harrows, etc.*—Numerous types of harrows have been tried out, ranging from very severe types like the Pitchpole, the New Zealand "Whakatane," the Aitkenhead, Howard "Dagger," Nicholson's "Star Turn" and Bamford's Grassland

Rejuvenator, down to the old moss harrows. Many of these have been tried both alone and in combinations, but so far none has proved severe enough in its action to make a fair seed bed on a hill sward after two or even three operations.

After severe harrowing or rotary cultivation it is always advisable, if possible, to burn the uprooted mat. This burning helps considerably in getting a seed-bed. During the first year of the Scheme various implements for collecting the mat were used and the most successful proved to be a road-sweeping brush. Latterly no attempt has been made to collect the mat. Cultivations are now done, as far as possible, in the autumn months, which plan permits of burning the mat during the dry period usually experienced in spring or early summer. Where the surface is particularly rough the land is sometimes fallowed for twelve months or more; indeed, some of the best "takes" have been obtained on land cultivated with the Austral cultivator and subsequently left fallow for a period of twelve to fifteen months. The arable farmer may consider such methods rather extravagant, but it must be borne in mind that the type of land in question is very cheap and there is usually plenty of it. It is also weed-free, so that no intermediate cultivations are required. Such treatment permits the thorough weathering of the soil and so gets it into better condition to take the seed. The seed is generally sown without any further cultivation, and the land is slagged and the seeds covered in one operation.

On the basis of complete records, the actual costs (excluding depreciation) have been :—

Ploughing and harrowing . . .	About 10/6 per acre.
Rotary cultivation	About 6/6 per acre.
Harrowing, four times, with "Pitchpole" and "Whakatane" harrows . .	About 12/- per acre.

The choice of the method of cultivation is governed by the crop proposed to be grown. For example, for cruciferous crops such as rapes and turnips ploughing is essential, but for "seeds" mixtures any one of the three methods can be used with a good measure of success. Ploughing generally results in a better "take" of grasses than either of the other two methods, but clover is always much slower in coming on the ploughed ground, and a good deal of bare land is seen for the first two years. After rotary cultivation, which, incidentally, is the cheapest method, there is a better "take" of clover than after ploughing, but, except in the case where the land has been fallowed, the "take" of grasses is not so good. Moreover, there is a much higher rate of moss colonization on the cultivated as opposed to the ploughed areas. After severe harrowing a good initial "take" of clover has been obtained in practically every case, but the "take" of grasses has always been poor—so poor, in fact, that it is doubtful whether it is a paying proposition to include any grasses in the mixture; in such cases wild white clover cleanings should probably be sown alone. Some of these points are still the subject of experiments, and it is too early to be dogmatic on any one of them.

Manuring.—A good deal of experimental work in connection with manuring is still going on, but the standard dressing used in the bulk of the Scheme's improvement work has been 6 cwt. of 32 per cent. basic slag and 1 cwt. nitro-chalk per acre. This is generally applied at the time of seeding. Potash has also been used, but with somewhat inconclusive results. Lime also has been tried, with very beneficial results. Incidentally, lime seems to help the establishment of the better grasses rather than that of the clover, but it is very doubtful whether it would be profitable to replace any of the phosphate with lime. How soon or how often it is necessary to repeat the dressing of phosphate, in order to maintain the fertility and productivity of the swards, is still a matter for experiment. All the improved swards on the Scheme's lands receive a second application of 6 cwt. of phosphate, usually Gafsa phosphate, before the end of their third year. In this connection it may be mentioned that experiments have shown that an initial dressing of 12 cwt. per acre, to last six years, is superior to two doses, each of 6 cwt. per acre, during the same period. The improved areas are usually, however, some distance from a road and, in a busy sowing season with a large area to be dealt with, it is impossible to transport so heavy a dressing without seriously interfering with the programme of work. This difficulty of transport, again, militates greatly against the use of lime in hill improvement work. On marshy and wet land where cultivation is very difficult, excellent results have been obtained by applying a very heavy initial dressing of phosphates—up to 20 cwt. per acre—and superimposing a heavy dressing of seed cleanings. The only condition necessary to success seems to be that the "mat" should not be very thick.

SEEDING AND CROPPING.

As previously stated, the bulk of the fattening crops grown consist of mixtures of rape and turnips, the rate of seeding being 2 lb. of the former and 3 lb. of the latter per acre. It has been found that turnips give a surer "take" than rape and succeed under conditions of lower fertility; moreover they seem, in the seedling stage, to prove less attractive to wood pigeons. On the other hand, when rape "takes" well it comes on much more quickly than turnips, and it has proved superior as a fattening crop. Other fattening crops have been or are in process of being tested. A sowing of rape and turnips invariably includes either Italian ryegrass, at the rate of 24 lb. per acre, to provide winter keep or, alternatively, if the land is to be sown down to permanent pasture, a seeds mixture.

The most important constituent of any "seeds" mixture for hill improvement is wild white clover, and for most purposes seedsmens' cleanings, rather than pure cleaned seed, are employed, These cleanings, owing to their content of weed seeds, are unfit for sowing under lowland conditions, but under hill conditions this seems to be no disadvantage. In fact the commoner weeds whose seeds are found in clover cleanings—such as ribwort plantain and daisy—have a high mineral content, and in consequence are of very great value in hill swards. The composition of the remainder of the mixture depends to a large extent on the type of land to be sown and on the number of years it is intended to leave the pasture down. Probably the best procedure would be to sow a fairly cheap seeds mixture after drastic harrowing or rotary cultivation and, after an interval of three or four years during which the clover would have built up soil fertility, to plough up and re-sow with a first-class mixture of pedigree seeds. It is important to remember that the poorer the land the higher is the necessary seed rate. Normally, on fairly good hill land, the seed rate for the first sowing would be as follows :—

	Lb. per acre.
Wild white clover cleanings	6–8
Indigenous perennial ryegrass cleanings	24–30
Crested dogstail cleanings	6–8
Yorkshire fog	4–6

On the better types of hill land the Yorkshire fog would be omitted altogether.

On rather better land this mixture could profitably be reinforced by the addition of 6–8 lb. each of grazing strains of pedigree perennial ryegrass and pedigree cocksfoot. On peaty or boggy land the cocksfoot should be substituted by 5 lb. of pedigree timothy.

Apart from its use in the above connection, special strains of timothy bred at the Welsh Plant Breeding Station have been used successfully for the wintering of sheep. Timothy is selected for this purpose because of its winter greenness and palatability and is sown in rows 18 inches apart, with a "Planet Junior" drill, at the rate of 8 lb. per acre. One pound of mustard seed is sown with the timothy, this plant acting as an indicator and so permitting early inter-row cultivation. This cultivation should be carried on throughout the year so as to keep the rows as clean as possible; swards of timothy sown broadcast have very rapidly become weed-infested. The seeds are sown in early June, a light hay crop is taken in early August and the rows are then dressed with 1 cwt. per acre nitro-chalk and closed from stock until November. Italian ryegrass is another winter-keep crop that has been used extensively. As mentioned earlier, it is usually sown with rape and turnips but, in one field in a very dirty condition, it has been grown with *strigosa* oats. This field was ploughed up in early May, as soon as the bulk of the ewes and lambs bas been drafted to the open hill. It was seeded down immediately with about 120 lb. of oats and 24 lb. of Italian ryegrass per acre. The oats were cut green about the end of July, before the weeds had seeded, and the Italian ryegrass dressed with 1 cwt. per acre of nitro-chalk. The field was then rested until November or December and subsequently used for wintering as occasion arose.

Kale is still under test as a sheep wintering crop but it demands a high degree of fertility and is, in consequence, more suitable for field than for hill conditions.

It may here be stated that all the fields when taken over by the Scheme were of very poor quality, being infested with weeds (including large numbers of docks) and almost devoid of wild white clover ; the dominant species in the swards were Yorkshire fog and bent grass. The majority of such fields as were amenable to ploughing have been ploughed up and seeded down with a good seeds mixture under oats, a procedure which has resulted in a tremendous improvement in the quality of the sward. The practical impossibility of maintaining good permanent pasture on hill land would seem to indicate that, under such conditions, the proportionate value of temporary to permanent swards is even higher than on lowland farms. The temporary ley has not only the longer growing season (thus producing more winter keep), but its growth, especially if cocksfoot be included in the mixture, commences earlier in spring, thus giving the lambing ewes a better start. At the same time the difficulty of maintaining the quality of temporary swards, especially when a succession of wet seasons causes unduly late hay harvests, is considerable even although hay cut from such swards is much more easily made, especially in indifferent weather, than that from old foggy pastures. The advent of grass-drying machinery may considerably affect this problem.

There still remain two types of improvable hill land not specifically dealt with so far, viz., bracken-infested land and wet marshy land infested with rushes. A fair proportion of the land improved by the Scheme formerly fell into the first category. One paddock in question was originally part of the open hill, its slopes being rendered practically useless for grazing on account of the deneness and strength of the bracken. In the spring of 1934 this paddock was ploughed to a depth of about

8 inches and left fallow until June. By this time a great difference could be seen in the strength of the growth of bracken on the ploughed and unploughed portions, growth being very much weaker on the former. Further cultivations were delayed till June when the implements battered down the young bracken shoots and thus saved the cost of scything. The block was now sown down with a mixture of rape, turnips and Italian ryegrass and was grazed early with lambs. The area was scythed over as soon as the lambs were turned elsewhere. The same operations have been carried out on this paddock for the last three years and have resulted in a reduction of bracken by at least 80 per cent. Other blocks of bracken-infested land on the higher portions of the hill were ploughed up in the winter of 1933–34, sown with a permanent mixture in May, 1934, and have since been mown over twice a year, at the end of June and in late August; here also the bracken has been reduced considerably. On a further paddock, ploughed and seeded in 1934, the bracken, while still in the curling stage, was harrowed some three times with bush and heavy harrows and later cut twice. It does not appear, however, that these additional operations have proved of much value, in eradicating the bracken, as compared to twice cutting alone. Various chemical methods have also been tested, cost in every case being the limiting factor. A dressing of sodium chlorate, applied in powdered form at the rate of 1½ cwt. per acre, has so far been the most promising, all growth having been completely destroyed.

The Scheme has improved several blocks of rush-infested land. The first was a 16-acre paddock, stone drained between 70 and 100 years ago, and carrying a very poor bent-dominant herbage infested with sedges, mat grass and rushes and, except on the area immediately surrounding the gateway, almost devoid of wild white clover. During the summer of 1933 the rushes were mown twice and collected for bedding, while in the subsequent winter the paddock was drastically harrowed with an Aitkenhead harrow and dressed with slag in January, 1934. During frosty weather the rushes were again mown and in the following May wild white clover cleanings were sown on the surface, which was again harrowed. The rushes have been mown twice in each subsequent summer and are now practically eradicated. The dominant plant in the herbage is now wild white clover.

A portion of rush-infested marsh on the hill has been treated on methods rather different from those outlined above. During the spring of 1933 the whole area was burnt over. Subsequently it was cultivated with the "Austral" rotary cultivator, slagged and seeded with cleanings. The subsequent management has been to graze heavily, in the latter half of April and in May, with cattle and ponies, and to mow in August or September. By these methods the rushes have been greatly reduced and the sward very much improved. Before this treatment was adopted *Molinia* was the dominant plant, but this species is now being replaced by bent grass and Yorkshire fog; wild white clover and lotus are also establishing themselves and spreading. Drainage would effect a considerable improvement here, but is too costly an operation for the Scheme to undertake. A few open furrows, cut with a big plough, have, however, considerably improved the surface drainage. Thus a great reduction in rushes, even on very wet land, has been proved possible through frequent mowing and heavy grazing, helped considerably by heavy slagging and the sowing of wild white clover cleanings.

STOCKING.

Because of the adverse climatic conditions and the natural poverty of the herbage, the normal stocking of hill grazings must consist principally of sheep. However, in order to keep hill pastures in good condition, a number of cattle must always be kept, that number depending to a great extent upon the quality of the land, the amount of hay made and the possibility of mowing the pastures as a complement to cattle grazing. To-day it is very rare to find a hill farm carrying a sufficient head of cattle. The Cahn Hill Improvement Scheme lands, though carrying a good many more cattle than similar farms in the district, are still understocked. For this there are two reasons, general and particular; firstly, the raising of ordinary store cattle has been most unprofitable during the last three or four years; secondly, the Scheme's land comprises much too high a proportion of open hill as opposed to fields and sheltered, improvable hill. In this connection it should be said that, in the selection of lands for the Scheme, the advisability of choosing land of a really difficult nature as regards poverty of soil, steepness of slopes and exposure, as against the reverse, was always borne in mind. It is only under adverse conditions that the various methods of hill improvement can be fully tested. Methods that have proved successful on the extremely difficult land of the Scheme are almost certain to succeed under kindlier conditions. Indeed, there is already some evidence that considerably better results as regards crops, live-weight increase of stock and winter carrying capacity are obtained under better conditions. Moreover, there is a proportionate reduction in operation costs as working conditions become easier.

At present the live stock owned by the Scheme comprises the following. A flock of some 2,000 Welsh Mountain ewes is run on the unenclosed sheep-walk of Nant Rhys. At Prignant is kept a ram-breeding flock of about 200 Improved Welsh Mountain ewes for purposes of stock improvement at Nant Rhys. At Pwllpeiran, the headquarters of the Scheme, there is no permanent flock, all the land being required for wintering sheep which are summered on the mountain. The same applies to the lands at Knighton. The improved swards at both places are used for fattening lambs on their dams. For this purpose about 400 couples are purchased annually in May, the bulk of the lambs being sold fat under the Ministry's grading scheme at Birmingham, Manchester or Liverpool. Those lambs that are not quite fat enough, when drafting takes place in August, are weaned and afterwards finished on rape and turnips on the hill. The dams are sold as draft ewes in September.

Lambs on Improved Pasture.

The quota of adult sheep which had to be taken over by the Scheme at Nant Rhys was 1,340. This was far too small a number for the summer capacity of the walk, but, on account of the elevation, exposure and the poverty of the pasture, about 50 per cent. above the winter carrying capacity. The excessive ratio of hill to fields (about 28 : 1), still makes impossible the wintering of the whole flock on the Scheme's land, although the improvement of the hill swards has tremendously increased the total winter carrying capacity.

The cattle stock consists of about 35–40 head of Welsh Black Cattle. All the heifer and bullock calves, as they reach an age of about nine months, are turned on to the improved hill from the beginning of June onwards; here they grow and thrive quite well. The younger stock are not left on the open hill as long as the older ones, but in October are brought down to the more sheltered fields. All the cows are pedigreed, and a fair trade has been done in bull calves. Most of the male calves are reared on their dams on the improved hill, the best being kept as bulls and the others sold as veal in September. Other breeds of cattle have been grazed on the hill—Shorthorns, Herefords and Aberdeen-Angus crosses—but where keep is poor, and especially under the more adverse climatic conditions, the native breed seems to thrive best.

The horses consist of one "half-legged" mare and three Welsh Cob mares, two of the latter being used for breeding purposes. The Scheme also owns a number of riding ponies and a small stud of Welsh Mountain ponies. Up till the present year a Welsh Mountain Pony stallion was run with these mares, but this season a Thoroughbred-Arab cross and a pure-bred Arab from Lady Wentworth's well known stud have been used, with the object of breeding a larger type of riding pony.

At present both cattle and ponies are used as scavengers of the "feg," or rough grass, on the improved pastures, and also for grazing down the matted herbage of marshland prior to manuring. Ponies especially, if used in sufficient numbers and at the right time, are great sward improvers; they are also of great use in summer for grazing bracken-infested woodlands, where maggot fly makes it unsafe to graze sheep. Such woodlands, grazed in summer by ponies, will provide much valuable sheep keep in winter.

MANAGEMENT OF CROPS AND STOCK.

At Nant Rhys about one-third of the adult sheep are wethers, ranging in age from one to two years. These are retained because they are better boundary keepers than breeding ewes, because they will graze the exposed slopes during winter, and because they can make paths out of snowdrifts for the remainder of the flock. Incidentally, the mutton of the mature mountain wether is not appreciated to-day as it ought to be. There is no mutton comparable to that of a well-finished four-year-old mountain wether. It must be hung for at least ten days and then, when properly cooked, it is delicious eating and a worthy dish for the epicure. So far, the sheep wintered at Nant Rhys have received no hand feeding, even during the severest weather. It is, however, proposed to carry out there, during the coming winter, some feeding trials with dried grass.

One of the greatest mistakes a flockmaster can make is to leave weak ewes on the hill during the winter. The past policy of the Scheme has been to gather three or four times during the winter and early spring and to draft down all the weakly ewes to graze on the improved hill at Pwllpeiran, or to be fed in the fields.

In the surrounding district the custom of farmers is to winter away, in the lowlands, practically all their ewe lambs and some of the smaller yearling ewes. During the last three years a number of experiments have been carried out to test various crops and methods for wintering a large proportion of the sheep at home. The first of these experiments was in the winter of 1933–34, when seven acres of pedigree timothy, sown in rows the previous June, were grazed. At the end of October 400 lambs were brought down from Nant Rhys; 290 of the best were sent away for the winter, 19 were sold and 91 remained to be wintered at home. In the middle of November these 91 lambs were brought down from improved hill pastures. They were allowed to graze for two hours per day on the timothy rows, being turned for the remainder of the twenty-four hours on to an adjoining 10-acre pasture of very poor quality; this field had been very badly grazed and contained chiefly bent and Yorkshire fog. The keep on the timothy rows was sufficient to last until February 12th. The lambs were then moved to a field of Italian ryegrass on which they grazed for one-and-a-half hours daily, the remainder of the day being spent on adjoining poor hill pasture. They continued on this system until March 26th when, owing to the scarcity of keep and the increasing needs of the weakly ewes drafted down from Nant Rhys, they were turned again on to the improved hill. At this date an inspection was made of the lambs which were being wintered away. These had been divided into fairly even lots among a number of lowland farms, but by this time there was some variation in their condition. This difference was mainly due to two causes, the difference in quality of the various pastures and the varying extent of the areas over which the various lots had been allowed to range. All the lambs had done well, though in varying degree, yet it is safe to say that the home-wintered lambs had at least caught up the best of those wintered away and compared well with the others as regards size, vigour and bloom. During the wintering period the lambs grazed on the timothy and Italian ryegrass had made more growth than any of the lambs wintered away. Moreover, the timothy rows and the adjoining 10-acre field, in addition to grazing the lambs from November 12th to February 12th, were, after a three weeks' rest, grazed for six weeks with 120 weakly ewes. A further 50 weakly ewes grazed in the Italian ryegrass field for seven weeks, during the first two weeks of which period they were grazing concurrently with the lambs.

During the winter of 1934–35, a similar wintering trial was carried out on the same field, but this time the lambs were kept from mid-October until early December in an improved paddock on the hill. Ninety-eight hill lambs were used for this experiment and, from December 5th, grazed the timothy rows, on exactly the same system as that employed during the previous winter. The lambs continued grazing under these conditions until March 16th. They were weighed at fortnightly intervals and at the end of the time showed a net increase of half-a-pound per head. The actual weighings and dates were as follow :—

Date.	Average weight per lamb (lb.).
December 5th, 1934	35·0
" 19th, 1934	36·0
January 6th, 1935	37·0
" 31st, 1935	34·0
February 13th, 1935	33·6
" 27th, 1935	34·0
March 15th, 1935	35·5

Although the lambs had thus not increased considerably in weight they were in good thrifty condition. During the same period approximately 350 lambs from the same flock were sent to winter on lowland farms. Grazing was taken on these farms because of their reputation both for doing stock well and for producing a condition, in the stock, favourable to its subsequent progress on its return to the hill pastures. Each group of lambs was weighed on departing for, and returning from, the lowlands. In every case a loss of weight was recorded, the average loss for the whole 350 being 1·1 lb. per head, a result which compares unfavourably with the slight gain of the lambs wintered at home on the timothy pasture.

During the winter 1935–36, the timothy rows were used for testing out the value of one good feed per day of mineral- and vitamin-efficient food for recuperating those ewes that had lost condition seriously on the hill. The last gathering of the open hill, for the purpose of drafting out weakly ewes, was made towards the end of February, when it was found that some of the younger ewes, owing to the severe weather experienced in the early part of the year, had fallen very low in condition. These were brought down to Pwllpeiran and 75 of the poorest were weighed and turned on to the old pasture adjoining the timothy rows, to which they had access for two hours each day. A further 75, only slightly better in condition than the previous batch, were picked out, weighed, turned on to a 9-acre meadow containing a good deal of keep and received, in addition, 10 oz. per day of maize. There was a marked difference in the response of these two groups of ewes to their respective treatments. In the first few days a distinct improvement was noticed in the timothy-grazed sheep. Their increasing activity and sharpness was in marked contrast to the continued sluggishness of the maize-fed ewes. After four weeks the two lots were weighed, when the timothy-grazed group showed an average increase of 8 lb. per head as against about 3 lb. per head for the maize-fed group. The former group looked so strong that it was decided to turn them out on one of the adjoining hill pastures to make way for other weakly ewes; practically every ewe in the batch reared a lamb, while the maize-fed group recorded only a 75 per cent. lambing.

Winter grazing figures have also been recorded for some of the enclosed blocks of hill pastures. One block, containing about 31½ acres, of which 25 acres have been improved, carried, on an average, well over two ewes per acre throughout the winters of 1934–35 and 1935–36. In both years these ewes reared their lambs on the hill. On some of the best sheltered improved blocks, at somewhat lower elevations, the winter carrying capacity has been nearer three to the acre, whereas the normal carrying capacity of the unimproved land is at the rate of one ewe per 3–4 acres.

Summer Grazing.—The policy adopted by the Scheme has been to graze the maximum possible number of sheep at Nant Rhys during the summer, all the ewes and lambs belonging to this farm being grazed on the open hill. This farm was originally very much understocked, and in order to permit of the drafting up of sheep and other stock from Pwllpeiran and Prignant, thus permitting the hill pastures on these farms to be rested, a new paddock of some 150 acres was fenced in 1934, while at the same time the fences of some smaller paddocks were repaired. This paddock has been of great value in the management both of the open sheep walk and of the improved hill. Sheep can now be gathered the day previous to shearing or dipping and kept near at hand. Moreover, weakly ewes can be brought to the paddock in spring, and the yearlings home from wintering can be turned to this paddock for the first two weeks to settle down. This is a great help, especially if severe weather be experienced, because yearlings, after wintering in the lowlands, often give a great deal of trouble on the open hill. Again, some of the best ewes from the various hefts can be collected and put in this paddock during tupping time; were this not done it would be extremely difficult to get new rams to settle down without losing a high proportion of them.

In July, 1934, a portion of the Prignant hill was cultivated with the rotary cultivator. The weather was very hot and dry and within a fortnight the area was burnt right through, the burning being so successful that it was decided to sow a "seeds" mixture immediately. The seeds took well, and the land was grazed without interruption for approximately twelve months from the day of sowing. An examination after this period seemed to indicate that hard grazing had spoilt the sward, a high proportion of the grasses and clovers having apparently been exterminated. However, after a two-months' rest, the pasture was transformed. A good number of the grasses had revived, and the sward was a thick mat of wild white clover. The practice now adopted is that all the sheep from the Prignant hill are sent up to Nant Rhys in the third week of July (after shearing there is finished), and the improved hills rested from sheep during August and September. The cattle, however, graze on the improved hill right through the summer.

The following table gives some idea of the difference in chemical composition of the herbage from the improved and unimproved pastures.

	Improved Pasture.		Adjoining Unimproved Pasture.
	Per cent. of Dry Matter.		
Ether Extract	3·41	...	2·85
Crude Protein	18·9	...	7·08
True Protein	12·42	...	6·21
Fibre	19·56	...	31·97
Soluble Carbohydrates	47·52	...	54·94
Phosphoric Acid (P_2O_5)	0·85	...	0·16
Lime (CaO)	0·55	...	0·20

From the above figures it will be seen that the improvement of the sward has resulted in a great increase in the protein, phosphoric acid and lime contents.

As indicating the extent of the improvement effected in the new pastures, the grazing records for a block on Pwllpeiran hill, improved in 1933, may be of interest. The original carrying capacity of Pwllpeiran hill in summer was one ewe and one store lamb per acre. During the summers of 1935 and 1936 a block of approximately 31 acres has grazed, on an average, 120 couples. At the end of July, 1935, when the first draft of 100 fat lambs was made for sale under the Ministry of Agriculture's grazing scheme, seventy-seven proved to be lambs from ewes that had grazed on this block. In 1936, again, the block provided sixty-seven of the first batch of 100 fat lambs.

As already mentioned, lambs not sold fat off their mothers are generally weaned early in August and finished on rape and turnips, being drafted out as they become ready for the butcher. The average fattening figure on hill-grown rape and turnips has been about twelve per acre. One area, in spite of its having suffered severely from drought, fattened eight per acre, while the best area fattened over fifteen lambs per acre, and gave a live-weight increase of over 95 lb. per acre.

During the late summer of 1935 an experiment was carried out on the relative fattening values of various crops. On May 31st a field was divided into four plots of approximately 2,940 square yards each in size. These plots were sown with rape, hardy green turnips, Italian ryegrass and Yorkshire fog respectively, and twenty lambs commenced grazing on each plot on August 23rd. They remained on the plots until September 23rd, when forty-seven of the eighty lambs were considered ready for killing. These forty-seven were drawn from the various plots as follows:—Rape, sixteen; turnips, seventeen; Italian ryegrass, ten; Yorkshire fog, four. The lambs were weighed regularly throughout the experiment and the weighings showed the following final net increases per lamb per plot:—Rape, 9½ lb.; turnips, 7 lb.; Italian ryegrass, 5 lb.; Yorkshire fog, 2 lb. The experiment is open to criticism on the ground that the plots were not replicated, but it should be borne in mind that there were twenty lambs on each plot. The results scarcely allow any definite conclusions to be drawn, but, coupled with actual observation, they indicate that the cruciferous crops tested are superior in fattening capacity to the grasses, rape giving a somewhat better return than turnips, and Italian ryegrass being by far the better of the two grasses. In this connection also it must be remembered that Italian ryegrass has a considerable value as winter keep, while Yorkshire fog, besides being inferior in fattening value, is of much less value as winter keep. It follows, therefore, that Yorkshire fog should be included in short-duration mixtures only on land that is incapable of producing a satisfactory stand of Italian ryegrass.

The foregoing remarks will have given some idea of the main aspects of the hill improvement work now being carried out by the Cahn Hill Improvement Scheme. Space does not permit useful reference to the important aspect of the cost of the work, since any account of the financial aspect would be of little value unless set out in considerable detail. The interested reader is referred to chapter eleven of Professor Stapledon's book, "The Land Now and To-morrow," where the whole subject is dealt with in full.

The Scheme has been in operation for only three-and-a-half years, and there is still a great deal of essentially experimental work ahead. At the present stage it is, however, possible to draw certain definite conclusions.

CONCLUSIONS.

The experiments carried out under the Scheme have established the following facts:—

(*a*) The grazing value of the drier slopes of hill land, ranging up to 1,400 feet, can be greatly increased.

(*b*) Swards previously containing *Molinia, Nardus* and bent can be converted into pastures containing at least 20 per cent. of wild white clover, with a fair percentage of crested dogstail, perennial ryegrass, cocksfoot and Yorkshire fog. Marshy land can be converted into quite good grazing by cultivation, the sowing of cleanings and manuring, accompanied by heavy grazing and mowing of the resulting sward. This improvement can be effected without the necessity for expensive drainage. Bracken-infested land can be greatly improved by ploughing, manuring and seeding, together with twice-yearly cutting of the bracken, at the end of June and in late August.

(*c*) To achieve these results, a combination of the following three operations is necessary and the omission of any one will greatly reduce the value of the results :—

1. Drastic cultivation, either by severe harrowing, rotary cultivation or ploughing.

2. Manuring with not less than 6 cwt. per acre of 32 per cent. basic slag, of high citric solubility, together with 1 cwt. per acre of nitro-chalk, or their equivalents of phosphate and nitrogen in other suitable forms.

3. The sowing of "seeds" mixtures made up of wild white clover (usually in the form of cleanings), crested dogstail, indigenous ryegrass and, if the soil be very poor, Yorkshire fog. Under good conditions the mixture should be supplemented with pedigree seeds of ryegrass and cocksfoot.

(*d*) The improved swards obtained have been found capable of carrying a sheep stock (Welsh Mountain breed) of approximately four ewes and four lambs per acre in summer, about 60 per cent. of the lambs being fit for slaughter off their dams. This compares with the summer capacity, before improvement, of one ewe and one store lamb per acre. In winter, when the old sward carried a very low head of stock (certainly not in excess of one ewe per four acres), two ewes per acre can now be carried from October to May.

(*e*) It has been found that quite good crops of rape and/or turnips can be grown up to altitudes of 1,350 feet and that such crops will fatten as many as twelve or fifteen lambs per acre, giving total live-weight increases up to 95 lb. per acre.

(*f*) Lambs and tegs can be successfully wintered by allowing them a two-hour period daily on wintergreen grasses such as timothy and Italian ryegrass, the remainder of the twenty-four hours being spent on poor pasture.

(*g*) It is essential to rest the improved swards for six to eight weeks at some period during the growing season. If their quality is to be maintained it is essential, in order to prevent the excessive formation of inflorescences, to graze very hard at certain periods of the year.

(*h*) Young cattle over nine months old can be successfully grazed on the hill during the summer months.

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MOSES GRIFFITH,
Lands Director,
Cahn Hill Improvement Scheme.

University College,
Aberystwyth.

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THE TECHNIQUE OF MODERN FIELD EXPERIMENTS.

IN the last volume of this *Journal*, G. E. Fussell (Ref. 1) traced the development of the technique of field experiments from its primitive beginnings to a period of great activity in the middle of last century. The early experiments had been essentially qualitative; a single area was treated in some special way and judged in terms of profit or by general experience. As "observation plots" such experiments still have their uses in providing experience of new crops, varieties, implements or processes and in testing drastic changes for which the criteria of success or failure are obvious. No elaborate experimental design would be required to ascertain whether a poor hill pasture could be reclaimed by cultivation, manuring and re-seeding or whether in a given place and season maize or soya-bean could be grown to maturity.

The stimulus to experimentation in the modern sense of comparing the yields from two or more treatments under closely comparable conditions was provided by the introduction of artificial fertilizers, such as guano, nitrate of soda and superphosphate, about a century ago. New and rapidly expanding markets had been created by the Industrial Revolution, and enterprising farmers were eager to explore new methods of increasing yields and profits. The novelty of laying out money for unusual materials kept questions of costs and returns in the foreground, and it appeared to be a perfectly straightforward plan to make the comparisons by treating halves or quarters of a field in two or four different ways and harvesting their produce separately. At the same time Liebig's provocative exposition of the Mineral Theory, with its challenge to the traditional supremacy of farmyard manure, made many converts and opponents who were anxious to support their views by actual tests. The Royal Agricultural Society, the Highland and Agricultural Society of Scotland and many local societies encouraged field trials by awarding premiums and publishing prize essays on the results. That this type of work was regarded as one of the main functions of the Royal Agricultural Society is shown by the quotation on the title pages of this *Journal* for its first fifty years (1840 to 1889) of the words of the German agricultural writer, von Thaer:—

> "These experiments, it is true, are not easy; still, they are in the power of every thinking husbandman. He who accomplishes but one, of however limited application, and takes care to report it faithfully, advances the subject, and, consequently, the practice of agriculture, and acquires thereby a right to the gratitude of his fellows, and of those who come after. To make many such is beyond the power

> of most individuals, and cannot be expected. The first care of all societies formed for the improvement of our science should be to prepare the forms of such experiments, and to distribute the execution of these among their members."

The most important experiments undertaken at this period were those of John Bennett Lawes at Rothamsted, who broke away completely from the normal commercial practice and set up continuous plots of the main farm crops with different manurings. It is unnecessary here to tell again the well-known story of these experiments, whose results were published in a long series of classical papers in this *Journal*. Originally, Lawes and Gilbert used long narrow strips, one for each kind of manuring; later their plots were arranged in rectangular form with strips of different mineral manures in one direction combined with strips of nitrogenous fertilizers running at right angles. Occasionally two unmanured plots were included in a single experiment, but otherwise Lawes and Gilbert do not seem to have been greatly concerned with the problems afforded by irregularities in soil fertility within their experimental fields. By steadfastly maintaining the essential features of their early designs they magnified the effects, and obtained a unique body of material for the study of seasonal changes and for an ever-growing range of subsidiary questions. But even in these classical experiments cross comparisons between plots are still subject to some uncertainty. Thus the wheat plots with nitrogen added in alternate years show, for the years without nitrogen, about the same mean yield as the ones permanently without nitrogen, from which the conclusion has been drawn that ammonium salts have no residual effect. On the other hand, in their response to rainfall these plots resemble the ones with added ammonium salts, and it now appears that the benefit from a small residual effect is offset by lower intrinsic fertility. One of the most dramatic Rothamsted results is an apparent residual effect of farmyard manure applied over sixty years ago, but the single plot concerned may have some unknown advantage over its neighbour, quite apart from the known difference in experimental treatment.

The publication in 1849 of James F. W. Johnston's book on "Experimental Agriculture, being the Results of Past and Suggestions for Future Experiments in Scientific and Practical Agriculture," was a most important landmark in the history of field experimentation because in it the actual design and criticism of field experiments were discussed for the first time as scientific problems. Fussell concluded his article by saying that it marked "the beginning of modern scientific field experimental technique and, at least in theory, the end of the vague, unsatisfactory and ill-defined experiments of early times." As some of the points brought out by Johnston nearly ninety years ago are still debated, or are dismissed as academic pedantries by some agriculturists and not a few of their technical advisers, condensed quotations from Johnston may be given on matters concerning the design of yield trials. (He uses the word "experiment" in several senses which are clear from the context, but to avoid ambiguity in quotation the modern term is occasionally given in brackets.) In his preface he says that the experiments of the forties, which were largely made to test his own suggestions,

> "are often contradictory in their results, often incorrectly or carelessly made, and occasionally exhibit, when criticized, evidence of total unworthiness. But they have never been criticized as a whole—the good separated from the bad, and the value of the experimental data they afford candidly weighed. And though my examination of what has hitherto been done in the way of field experiment has led me to the conviction that scarcely any of the results we have as yet obtained are to be relied upon as secure grounds for scientific opinion, yet they may be considered to have cleared the path to surer results by pointing out sources of error previously unknown, and thus indicating the precautions which must be adopted in future trials."

Among the precautions to be adopted by the rural experimenter were :

> "(1) Everything should be done by weight and measure ; (2) both the chemical composition and the physical qualities or condition of all substances employed should be accurately ascertained and recorded ; (3) two experiments (replicates) of the same kind, one to check the other, should always be made. In field experiments the two plots devoted to the same experiment (treatment) should be as far removed from each other as is convenient, with the view of getting rid of the influence of soil, exposure, etc., which, though unperceived, may yet sensibly modify the result of any given application to the land. Thus, if four substances, 1, 2, 3, 4, are to be tried on as many quarter acres, a square or oblong of two acres might be sub-divided as follows :—

1	2	3	4
3	4	1	2

1	2
3	4
2	1
4	3

> (4) land experimented upon ought to be in a uniform, natural and well-understood condition ; (5) a second experiment must not be made on the same spot, except as a sequel or continuation of a former one, until several years have elapsed ; (6) all experiments ought to be contrived and executed with a definite object, which should be one

which the person to whom the execution or superintendence of the experiment is entrusted can clearly understand; (7) all experiments must be comparative. If the effect of a certain influence—of a special manure, for example—is to be ascertained, that effect must be compared with what is seen upon another spot to which this manure has not been applied. But to ascertain the precise effect of this one influence every other influence likely to modify it must be excluded. This is a requirement of vital importance—and exceedingly difficult to be attained.

"The reader will see the necessity of not only accurately observing and recording results but of tracing and attributing them to their precise causes, if he considers the evils that flow from the publication of experimental results which have not been carefully attained. Thus a badly made or imperfectly observed and criticized experiment is not merely time and money lost, but it leads—

"(1) To the adoption and introduction among our received views and into our standard books of incorrect results, and of erroneous deductions and opinions. . . .

"(2) To loss of money in practice by the ill advice it gives.

"(3) To the neglect of further researches or experiments of a similar kind on the part of purely scientific agriculturists. . . . Thus by incorrect experiments—instead of being promoted, as by such trials it ought to be—agriculture, both as a science and an art, is materially restrained, and the attainment of truth hindered and delayed."

Importance of ascertaining the limits of natural variation in the productiveness of an experimental field. Necessity of double experiments.

"No adequate or satisfactory consideration has yet been given to the question—'When are results to be considered as identical?' I have elsewhere[1] drawn attention to the importance of this question, and endeavoured to show how the neglect of it alone throws doubt on most of the experimental results hitherto published. . . . From these results (instances in which unmanured duplicates differed by 23, 7, 31 and 14 per cent. of their means) it appears that, upon land in an ordinary condition, two portions of the same field—supposed to be equal in quality, and for that reason selected as especially fitted for experimental trials—may naturally yield very considerable differences in crop, even when no manure is added to them.

"It should also be borne in mind that a single difference between two experiments made on the same field cannot safely be regarded as an index of the maximum differences which the several parts of the field would be found to yield. When we make two experiments (replicates) on a field we find a certain difference between the two results. But if we had made a third a still larger difference, compared with one of the other two experiments, might possibly have been obtained. We have as yet no experiments from which we can deduce the limits of such differences in any soils.

"Two or more experiments must in each case be made, if any trustworthy or useful determinations are to be obtained. But in what way are the results of two or more experiments we may make to be regarded? Are we to take the mean or average result of the whole . . . or are the results of the several experiments to be

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[1] In a lecture to the Royal Agricultural Society at the York meeting in 1848, entitled "The Present State of Agriculture in its Relations to Chemistry and Geology," *Jour. Royal Agric. Soc.*, 1848, 9, 200.

> compared each with each, and the absolute effects to be deduced according to some other method?" (After giving examples with three or four unmanured plots and single manured plots, he concludes), "Had there been four separate experiments made with each of the substances then the mean of each set being taken and compared together, a very satisfactory result might have been obtained. As yet we do not possess any such system of mean results, though few things would at present do more to clear up our ideas as to the precise influence of this or that substance on the growth of plants."

In the absence of such replication Johnston considered that it would be wise to regard all differences of between 5 and 10 per cent. as within the limits of natural variation. He showed how groups of related treatments could be used to test consistency, and he also suggested that in experimenting with any two fertilizers "we must have at least two experiments with each taken singly and two with the mixture which contains them."

Johnston's enquiry "When are results to be considered as identical?" had to wait for sixty years before a tentative answer was provided through the collaboration of agricultural experimenters with an astronomer in this country and with a physicist in Germany, and for still another twenty years before the answer was expressed in such a clear and convenient form that field experimentation could develop rapidly in new directions and again become the vital link between theory and practice in agriculture.

Johnston's requirements appear to have proved too stringent for his contemporaries, though T. Anderson (Ref. 2), his successor in the post of Agricultural Chemist to the Highland and Agricultural Society of Scotland, reported a few experiments in duplicate with all combinations of a number of treatments, as *e.g.* :—

TREATMENTS AND PLOT NUMBERS.

	Coprolite.	Bone Ash.	Guano.	No Phosphate.
Sulphate of Ammonia .	1	2	3	10
Glue	4	5	6	11
No Nitrogen . . .	7	8	9	0 (twice)

ARRANGEMENT OF PLOTS.

1	2	3	4	0	5	6	7	8	9	10	11	0
0	6	7	8	9	10	11	1	0	2	3	4	5

He also suggested (Ref. 3) that the uniformity of the land should first be tested by marking out the plots and harvesting and weighing their produce in the year preceding the experiment proper. Anderson discussed the optimal size of plot and fully realized the merits of small plots between 1/20th and 1/112th acre :—

> "In chemistry the experimenters of the sixteenth century used pounds and those of the eighteenth ounces, where we use grains, while there is no comparison whatever between the accuracy of the

> results. It must not be supposed, however, that the use of small plots makes the experiment easy; the very reverse of this is the case and it will be found by those who undertake them that they require greater care and attention to minutiæ; but on the other hand a greater number can be made and they are more rapidly performed.
>
> "There is no question at all that if farmers are satisfied with small experiments, the number and variety of those performed are likely to increase very greatly, because they can be carried out at a much smaller expense than large experiments and a large number of individuals will thus be induced to engage in them. Whatever may be the size of the plots the experimenter may resolve to employ, he should never forget that single experiments have comparatively little value, and that every result to be trustworthy should be made in duplicate, and, better still, if it is repeated three or even four times on the same soil. So great is the importance of this precaution, that it may safely be asserted that if a person has resolved to set aside a sufficiency of land for experiments in half-acre plots with ten manures, the value of his results would be increased fifty-fold by dividing each space into four so as to make it a fourfold experiment."

In a lecture to the Royal Agricultural Society in 1866 on "The Conditions to be observed in carrying out Field Experiments," A. Voelcker (Ref. 4) emphasized the difficulties. After describing experiments with potash salts on six farms for four years, he said :—

> "If you asked me plainly the question 'Does Potash produce any beneficial effect on farm produce?' I should be at a loss to answer either in the affirmative or the negative. I cannot say I have as yet obtained a decided result. Each year there has been brought to light some accidental occurrence which had been overlooked. Indeed, we have to learn how to perform field experiments." (He did not go as far as Johnston and Anderson in advocating replicating all treatments, but said that) : "Care should be taken to reserve two or three plots on which no manure was to be applied. This is necessary to ascertain the limits of the natural variation in the productive powers of the different parts of the same field . . . and indeed it would be well to ascertain them by a previous trial in order that we may except certain fields altogether from our experiments. Lastly, in order to be truly valuable, field trials should be continued for a succession of years, and if possible, on a variety of soils, so that from a great number of experiments we may eliminate the disturbing influences which the variation in soils necessarily produce in the general result."

The experimenters in the second half of the nineteenth century do not appear to have been seriously concerned with soils as such. They sought the average effect of fertilizers, and their unreplicated experiments were unable to distinguish between those unexpected results which may have been due to local irregularities in soil fertility and those much more important ones which depended on vital differences between soils.

They do not appear to have contemplated the possibility that the soil might profoundly modify the action of certain fertilizers and that the relative values of two kinds of ferlilizers might vary greatly with the type of soil.

As Professor James Hendrick recently said (Ref. 5) in his Presidential address to the Agriculture Section of the British Association, " even till the second decade of the present century, our view of soils was narrow and insular. All others were expected to conform to 'This blessed plot, this earth, this England' and it was a most blessed plot of the south-east of England which was the standard."

The dangers of generalizing from a few experiments which were not fully representative and which did not contain within themselves evidence of their validity, are shown by the following quotation from a paper by A. Voelcker (Ref. 6) in reply to Jamieson's claim that, in Aberdeenshire, he had obtained almost as good results from mineral phosphate as from superphosphate. It will be noted that Jamieson was no less sweeping than Voelcker in his generalizations.

> " The results of these field experiments apparently tend to show that mineral-phosphates in a finely ground condition are but little less efficacious than after treatment with sulphuric acid, and that it is more economical to manure root-crops with finely ground coprolites and other kinds of mineral-phosphates than with superphosphate made from these materials. If this practical recommendation which Mr. Jamieson has given to turnip-growers is based on experiments to which no objection can be taken, if other experimenters in the main arrive at the same conclusion as Mr. Jamieson, it is clear that for the last twenty-five or thirty years agriculturists have been altogether wrong in applying superphosphate to their root crops instead of the ground raw materials from which it is produced, and that the manufacture of superphosphate, in which millions of pounds sterling are embarked, has been established on unsound principles, and carried on for more than twenty-five years to the disadvantage of the farmer.
>
> " It is not my intention to make any critical remarks on Mr. Jamieson's field experiments, nor to controvert his bold assertion that the results of the Aberdeenshire field experiment will cause a complete revolution in the manufacture of artificial manures, but I propose simply to direct attention to a few published experiments which are diametrically opposed in their results to those which Mr. Jamieson has obtained, and which conclusively prove the economy and beneficial effects of dissolved phosphatic manures in comparison with the raw materials from which they are manufactured."

Experiments of half-a-century later (Ref. 7) provided examples of both of the kinds of results, which had been debated in the " Battle of the Phosphates " in the eighties, with the important addition that it was possible to relate the differences to the properties of the soils tested. Ground mineral phosphate often gives very good results on very acid soils but very rarely does so on slightly acid or neutral soils.

In the last quarter of the nineteenth century there were many discussions on the relative merits of restricting field trials to special Experiment Stations along the lines of those which were rapidly being set up on the Continent and in America, and of distributing field experiments over a number of commercial farms.

The Royal Agricultural Society tried both methods. The Woburn Experiment Station was started in 1876, largely to test the unexhausted manurial values of purchased feeding stuffs. In 1886 a series of co-operative fertilizer trials was inaugurated at the suggestion of the Norfolk Chamber of Agriculture. The results were published in this *Journal* for three years only, but the Norfolk Chamber of Agriculture persevered with its own experiments and issued a notable series of reports over a long period. But no novel principle was introduced and the experiments, with about a dozen single-plot treatments and duplicate unmanured controls, did not reach the standards set up by Johnston and his immediate successors.

Many of the series of experiments started along these lines were abandoned on the alleged grounds of a run of unfavourable seasons, and, as T. B. Wood (Ref. 8) said in 1913 :—

> " Half the reports of such trials consist of explanations of the discrepancies between the results obtained and the results which should have been obtained. The moral is obvious. The single plot method signally fails when the subject of investigation is with differences of 10 per cent."

The staffs of the Technical Colleges and Agricultural Institutes and the County Agricultural Organizers appointed through a Treasury windfall—the Whisky money of 1890—had slender resources and aimed in their field trials at convincing visual demonstrations for educational purposes rather than at advancing knowledge or improving the art of agricultural experimentation. At the present time a convention has come to be accepted in some quarters by which a trial without replication is termed a " demonstration " and a replicated one an " experiment." Practical men have probably not ignored the circumstance that these demonstrations, like those by fertilizer firms and seedsmen, are subject to the limitation of possessing publicity value only when the obvious effects are in the expected direction. As the results of demonstrations are not systematically collected and published, it is not possible to obtain even a gradual approach to local averages. During the second half of the nineteenth century the early enthusiasm for local field experimentation seems to have been damped by the uncertainty of single-plot experiments and by a disinclination to face the cost of organizing more ambitious ones.

FERTILIZER EXPERIMENTS ON THE CONTINENT.

Systematic field trials began much later on the Continent (Ref. 9) than in England, but they were taken up more enthusiastically and soon reached a higher standard of accuracy. In the seventies and eighties a chain of Agricultural Experiment Stations was set up in Germany to control the quality of seeds, fertilizers and feeding stuffs, to advise local farmers and to conduct research. Several of these stations began continuous experiments after the Rothamsted model and others endeavoured to improve the ordinary annual experiments on their own farms and to devise methods appropriate for yield trials on commercial farms. Investigations were made on degrees of replication, various sizes and shapes of plots, and the possibilities of supplementing field trials by experiments on artificially mixed soil in large brick pits or in pots. Thus P. Wagner (Ref. 10) used up to six-fold replication in field experiments in small plots. In order to reduce the cost of threshing cereals from a large number of plots at widely separated farms he proposed that the total sheaf weights per plot should be taken immediately after scything, and that a 10 lb. sample from every plot should be weighed out at once and then air-dried and, when convenient, threshed in a sack to provide figures by which the fresh weight of total produce could be reduced to air-dry grain and straw.

The experiments and controversies of this period led to a fairly general recognition of the merits of replicating treatments in comparatively small plots. The general position towards the end of the century is shown in P. Wagner's "Suggestions for conducting reliable practical experiments," which was published in an English translation in 1898 by Chemical Works, late H. and E. Albert. A typical proposal consisted of the following treatments tested in triplicate :—

TREATMENTS.

1 . Nil.
2 . ½N, P, K.
3 . N, P, K.
4 . N, P, —
5 . N, —, K.
6 . —, P, K.

when N = 3 cwt. nitrate of soda per acre.
P = 4½ cwt. basic slag per acre.
K = 1¼ cwt. chloride of potash per acre.

ARRANGEMENT.

1	2	3	4	5	6	1	2	3
4	5	6	1	2	3	4	5	6

P. Wagner recommended plots of 100 square metres for Continental use or the English equivalent of 1/40th acre (11 yards × 11 yards). It is interesting to note that this size has proved the most popular in many of the recent experiments.

When Chambers of Agriculture were formed in Germany at the end of the nineteenth century, more stations were set up with a steadily increasing number of field experiments on commercial farms on patterns standardized by the German Agricultural Society. By 1930 there were thirty-two experimental farms at Universities and Colleges, thirty run by other Official Stations, forty-two by Chambers of Agriculture and four by private bodies. It was found, however, that experiments conducted on outside farms suffered from heavy travel costs and from a rather high proportion of accidental failures. These difficulties were overcome after the War by setting up local "Experiment Rings," which increased in number from the first in 1921 to 700 in 1929. The early Rings received no support from outside sources, the local farmers bearing the whole of the cost. Later, and especially for peasant farms, some State support was provided. In 1930 the average annual cost was about 5,000 Reichsmarks (£250 at par) and the subsidy about 1,250 RM. (£62) per Ring. For this sum one organizer, often the Head of the local Agricultural School or a young graduate in Agriculture, could carry out under the most favourable conditions about seventy experiments with four treatments in fourfold replication, though for difficult crops, such as cereals, the numbers were much lower, say, fifteen. Four- or five-fold replication was general with plots of about 12 square yards for cereals and about 30 square yards for roots. At two of the Experiment Rings which the writer visited near Halle in 1929 the members' subscriptions were *5d.* and *8d.*, respectively, per acre. One Ring had thirty-two farms with one experiment on nearly every farm ; the other had twenty of its fifty experiments on the home farm of the Chairman of the Ring. In 1929 the members of 700 Rings, covering about 2,000,000 acres, carried out about 36,000 experiments. The Rings generally worked in close contact with a Chamber of Agriculture, an Experiment Station or a University and were thus able to have vast numbers of analyses of soils and fertilizers carried out at very low costs. The results of the experiments were made available to members within a fortnight or so of harvest and were used by the organizer in advising on cropping and manuring for the following season. Only occasionally were the results published, and it was sometimes argued that such publication was undesirable lest the "gate-crasher," who tried to profit by the results of the local Rings without sharing in their labours, might be misled if his land differed widely from that used in the experiments.

The interest in field experimentation has reacted on soil research which, in Germany, has been largely directed to discovering an analytical basis for sound advice on manuring and liming. The more popular methods have been used for vast numbers of soils. Thus the associated Experiment Rings in Angeln, Kappeln, set up a "work's laboratory" which between 1926 and 1934 conducted over 16,000 Neubauer analyses of soils for available phosphorus and potassium and over 18,000 determinations of lime requirements and hydrogen-ion concentration.

Somewhat similar methods of organizing field experiments are adopted in Sweden and Denmark by local farmers' organizations working in co-operation with official bodies. The full results are published annually, and the averages of all former experiments are given in such a way that the farmers of each district may know what prices must be obtained for their produce to make the use of each of the three principal fertilizers profitable on the average soils of the district. In addition, the soils of the experimental fields are analyzed with the object of finding better methods of discriminating between the more responsive and the less responsive soils. The Swedish report for 1933 gives the detailed results of 2,885 field trials on fertilizers with averages for similar trials for six years, grouped according to district, crop and soil type. Similar trials are conducted in large numbers on different varieties of farm crops, in order to select those most suitable for each district and to introduce rapidly to practice the products of the plant-breeding stations. Almost all of the experiments are well replicated in comparatively small plots. For the last twenty-five years or so Germany and the Scandinavian countries have been far ahead of Great Britain in their methods of organizing field experiments on representative commercial farms.

YIELD TRIALS ON VARIETIES.

Early in the twentieth century the introduction of many new varieties of farm crops, and the systematic research into plant genetics inspired by the republication of Mendel's work, called for greatly improved methods of conducting yield trials. Comparatively small increases in yield could be profitable when the only additional outlay was for better seed, and it became important to be able to detect differences in yield of the order of 5 or 10 per cent. Further, it was often necessary to form an opinion on the potentialities of many selections when only small amounts of seed were available. The accuracy of the yield trials was improved by increasing the number of replicates, by very careful sowing and cultivation, and by preventing such gross irregularities as may be caused in cereal experiments by the depredation of birds. Large numbers of very small plots were enclosed in wire cages in so-called "chess-board plots." Thus from 1910 E. S. Beaven (Ref. 11), at Warminster, used twenty-fold replication of plots of 4 feet square, which were reduced to 3 feet square for harvesting in order to eliminate disturbances at the edges, where different varieties were growing side by side. For large-scale trials comparing two varieties he invented, in 1920, his well-known "half-drill-strip method," in which the two varieties (A and B) were drilled simultaneously from two halves of the seed drill so as to produce a series of long narrow strips running across the field in the order AB/BA/AB/BA, etc. In this way the comparisons were made on closely adjacent plots. Any regular drift in fertility from one side to the other was eliminated by taking the unit as ABBA, since the average position of the two A's then coincides with that of the two B's.

In order to compare several varieties it was necessary to take one as the standard and repeat this in each set of comparisons. Scandinavian plant breeders and agronomists worked out other types of plot arrangement intended to balance out regular fertility changes across the experimental area. Two examples of such arrangements are :—

SONNE.
7 treatments,
4-fold repetition.

A	F	E	G
B	G	D	F
C	A	C	E
D	B	B	D
E	C	A	C
F	D	G	B
G	E	F	A

KNUT VIK.
5 treatments,
5-fold replication.

A	B	C	D	E
C	D	E	A	B
E	A	B	C	D
B	C	D	E	A
D	E	A	B	C

The first of these was used in what A. D. Hall described in 1909 as "the most carefully elaborated series of field trials for practical purposes which have ever been carried out." The plots were each about 1/80th acre. It is of interest to note that in these and in a number of other popular arrangements the positions of most of the replicates are related to each other by the Knight's Move in Chess, as in the examples previously quoted from Johnston's book of sixty years before.

THE INTRODUCTION OF STATISTICAL METHODS.

The next step needed was to answer Johnston's important question, "When are results to be considered as identical?" Statisticians had developed methods of studying the variations encountered in measurements on large numbers of men, animals, and plants, but their methods seemed inappropriate for the comparatively small numbers of plots used even in ambitious field experiments. Astronomers, physicists and other experimenters had long made a practice of repeating their measurements several times, taking the average, and then estimating its precision by using a formula based on the Theory of Probability, the essential feature being to add not the deviations of the individual measurements from their mean but the squares of these quantities. It was the association of an astronomer with an agriculturist which first led in England to the mathematical treatment of the errors in yield trials. The first step was to find the extent and distribution of the natural variations by harvesting the crop on as uniform an area as possible in a large number of separate small plots. In 1909, T. B. Wood and F. J. M. Stratton (Ref. 12) examined the variations in the weights of mangolds lifted from an area of 0·9 acre divided into plots of 1/1,000th acre. In the following year, W. B. Mercer and A. D. Hall (Ref. 13) harvested an acre of wheat in plots of 1/500th acre and an acre of mangolds in plots of 1/200th acre. About the same time, E. G. Montgomery (Ref. 14), in Nebraska, harvested 7/45ths acre of wheat in plots of 1/1,440th acre in two consecutive years. These and similar measurements on other agricultural and horticultural materials were fully discussed at the British Association Meeting in 1911 and the series of papers was given wider publicity as a Supplement (No. 7) to the *Journal* of the Board of Agriculture, entitled, "The Interpretation of the Results of Agricultural Experiments." The results of Mercer and Hall's wheat plots are shown in Fig. 1, in which the yields are grouped into steps of 0·2 lb. per plot and the numbers in each group compared with those to be expected if the distribution followed the Normal Error Curve. The agreement justified the use for such material of other statistical expressions based on this curve. Although the area had been selected as especially uniform, it will be seen that the actual yields per plot varied between extremes of 2·8 to 5·2 lb. per plot. There were no very pronounced regularities in the variation of yields across the experimental area, but, as would be expected, adjacent plots tended to be more alike than those farther apart. By grouping the plots into larger units it was possible to enquire into the variation of experimental error with plot size. Much later the data from these and other "uniformity trials" proved extremely valuable for testing the merits of different methods of arranging plots.

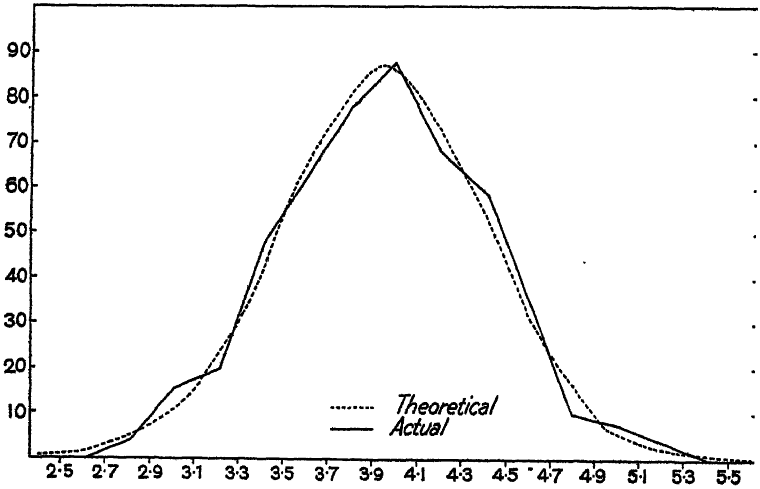

FIG. 1.—Theoretical and actual frequency curves for lb. of wheat grain in 500 plots each of 1/500th acre (Mercer and Hall).

It was clear from these uniformity trials that differently treated plots should be grouped fairly closely together, and it was generally assumed that the similarly treated ones should be repeated in some systematic pattern in the hope that the unavoidable errors would be sufficiently irregular to give a fair answer. It was also possible to find how the error varied with the size of the unit plot, and how many plots were needed to attain a prescribed degree of accuracy. Hall and Mercer concluded that :

> "For practical purposes each unit of comparison (variety, method of manuring, etc.) should be given five plots of one-fortieth acre, each systematically distributed within the experimental area."

Their paper had an appendix under the pseudonym "Student" on "A method of arranging plots so as to utilize a given area of land to the best advantage in testing two varieties." The two varieties were to be sown on the black and white squares of a chessboard arrangement and at harvest the squares were to be divided into two and each half-square compared with its neighbour of opposite colour. The same writer made a notable contribution to theoretical statistics by developing formulæ and tables from which it was possible to calculate how often differences of prescribed magnitude would turn up by chance in small samples drawn from a large population similar to that represented by the experimental data. It thus became possible to estimate the probability of getting an observed difference by chance fluctuations and to prescribe limits (such as one in twenty or one in a hundred) above which an observed effect would not be accepted as established or "significant."

In America and elsewhere many uniformity trials and experiments to determine the optimal shape and size of plots were carried out from about 1910. The position in 1917 is shown in an American Society of Agronomy "Report of the Committee on Standardization of Field Experiments" (Ref. 15).

Those who had already appreciated the need for replication began to add figures for the so-called "probable error" to their statements of yields, but there was no uniform method of calculating or using these quantities.

RANDOMIZED EXPERIMENTS AND THE ANALYSIS OF VARIANCE.

Shortly after the War important advances in statistical theory were made by R. A. Fisher at Rothamsted. He developed rigid methods of testing the significance of differences between such comparatively small numbers of yields as are available in most field trials and elaborated a formal method for analysing the results—"The Analysis of Variance"—which led to many new methods of designing field experiments and placed the testing of their results on a firm basis. For established forms of experiment the actual arithmetic was reduced to a simple routine which could readily be acquired by non-mathematically-minded experimenters or their laboratory assistants, provided that they were equipped with certain standard tables and either a calculating machine or a table of squares. If a few essential points are given careful attention in the design and lay-out of experiments there is now no longer any excuse for that ambiguity which was the bugbear of so much of the earlier work. Although no individual difference can ever be certain, the probability of it arising by chance can be expressed objectively. The method of analysis reveals directly the contributions of the various controlled factors and the uncontrolled ones to the total variation in the experiment, and the effects of any one of the factors may be compared with those which, being beyond control, are conventionally termed "error." The magnitude of these latter is expressed as a "standard error," and a statement of mean yields with their standard errors contains all of the information necessary for a sound judgment by anyone familiar with the method of analysis or with a few simple rules.

The basis and application of the Analysis of Variance are fully treated in Fisher's well-known "Statistical Methods for Research Workers" and in his more recent and less mathematical book "The Design of Experiments." A more elementary account with a discussion of important practical details in the conduct of agricultural experiments is given by J. Wishart and H. G. Sanders in "Principles and Practice of Field Experimentation."

No attempt will be made here to explain the working details of "The Analysis of Variance," but it may be profitable to consider one or two general points and to illustrate a few of the new types of field experiments which have been rendered possible by its use.

All experiments must be comparative and each treatment must be given to a series of plots, partly to reduce the errors by having comparisons on smaller and scattered plots, and partly in order that the variations between similarly treated plots may provide a measure of the reliability of the differences in yield between groups of dissimilarly treated plots. The size and number of plots must be chosen so that the accuracy attainable from that number is commensurate with the importance and cost of the experiment and with the precautions to be taken to ensure accuracy in the actual conduct of the experiment. Statistical treatment is no substitute for careless workmanship but, on the other hand, meticulous accuracy at isolated stages, *e.g.*, in weighing, will not compensate for gross irregularities in soil fertility or for the uncertainties left by using too few plots.

It is important that the estimate of the error of the mean yields of the similarly treated plots should be valid and unbiassed. The tests of significance give the odds or probability that such a grouping of yields should occur by chance, and it is necessary therefore to insist that any two plots (subject to restrictions to be considered later) should have the same probability of being treated alike and the same probability of being treated differently in each of the ways in which this is possible. This is possible only if the actual assigning of treatments to plots is performed by "process of randomization" as, for example, by dealing cards, throwing dice or reading off numbers from tables previously prepared in some such way.

No element in the new methods has proved a greater stumbling block to those accustomed to the older methods of systematic or balanced arrangements. Randomization has often been criticized on the grounds: (1) that chance arrangements sometimes bring "control plots" close together (2) that the appearance of the plots in the field is confusing and gives no immediate visual impression of the direction of the results, and (3) that there is a greater risk of making mistakes by putting a given treatment—seed or manure—on the wrong plots. Those who have regarded randomization as an academic pedantry should remember that in feudal times when the fair allocation of many strips of land between a group of individuals was of vital importance to the whole community, randomization was the only recognized method. Some of the maps of strip holdings in manorial times are surprisingly similar to those of ambitious modern experiments.

The objections to such systematic arrangements as A B C D, A B C D, etc., can be seen by considering that the comparisons of adjacent plots (*e.g.*, B and C) must always be more accurate than those of more widely separated ones, *e.g.*, (B and D), that any component of soil fertility which increases across the experimental area must favour the D plots at the expense of the A plots, and that any periodic irregularity which recurs at intervals similar to those between replicates might cause considerable bias to the average yields from the various treatments. Ploughing "lands" and the distribution of farmyard manure or lime from small heaps may produce most disturbing effects in any systematic pattern. Some of the more elaborate systematic patterns, such as that of Knut Vik, are certainly nicely balanced and should distribute the grosser differences in fertility between all of the treatments, but it must be realized that this is achieved only by increasing the discrepancies between the individual yields for similar treatments, *i.e.*, by increasing the estimates of error from which the significance of the observed treatment effects is to be judged. In consequence of this overestimate of error some real effects may be missed.

It is not, however, necessary to allot the plots at random over the whole experimental area. The treatments may be grouped in such a way that each occurs once within a fraction of the experimental area, which fraction is termed a "block." The average difference in fertility between the plots of one block and those of another thus appears on each side of every comparison, and does not contribute to the error of the treatment means. The advantage of using blocks and the method of analysing the variance may be illustrated from Mercer and Hall's Uniformity Trial on Wheat. In Fig. 2*a* the yields of thirty-six plots, each of about 1/40th acre, were converted into deviations from the mean of all thirty-six plots, and squares constructed with sides equal to these deviations. It is at once obvious that the left half of the area yielded better than the right half, the difference being particularly great at the bottom of the diagram. If the area were divided into six blocks, as shown, and six treatments given to the six plots in each block, the difference between the blocks, as shown by the sums of the treatment yields for each block, would not affect the differences between treatments.

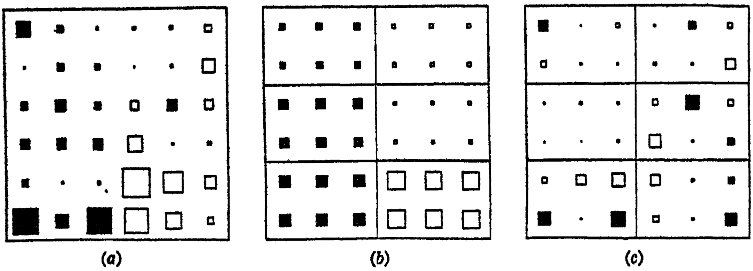

FIG. 2.—Illustration of block effects in the analysis of variance. For each of 36 plots of 1/40th acre, in Mercer and Hall's uniformity trial on wheat, a square was drawn with a side equal to the deviation of the plot yield from the general mean for :—

(*a*) individual plots ;
(*b*) block means ;
(*c*) individual plots less block means.

Yields above and below the general mean are shown by black and open squares respectively.

From the deviation of each plot from the general mean an amount, shown in Fig. 2*b*, could be subtracted to represent the irregularities due to blocks ; after this deduction we should be left with the remaining or uncontrolled errors shown in Fig. 3*c*. It is at once obvious that the errors due to positional effects will be greatly reduced by splitting up the experiment into blocks.

The "randomized block" method just illustrated has the great merit of extreme flexibility in that the blocks may be of any convenient size and pattern, provided that the experimenter does everything in his power to ensure that the soil and other uncontrollable conditions within each block are as uniform as is possible. The efficient demarcation of blocks within the area available makes great calls on the skill and foresight of the experimenter. The blocks must be as compact as possible. Long narrow plots within the blocks tend to even out irregularities at the expense of increasing the length of the edges at which differently treated plants are growing in competition or are profiting by the open spaces of paths. These effects should be cut down by discarding a row or strip along the edge of each plot. It has been found that, in experiments with root crops, satisfactory results may be got by sacrificing in this way as much as one-half of the total area, for instance, in four-row plots only the two central rows may be harvested and weighed. For cereals and certain other crops, such cutting-out of edge rows is inconvenient, and the plots are then laid out, as is shown in Fig. 2, in a window-pane pattern of rectangular or square plots which gives a minimal ratio of edges to area.

Often the experimenter has no grounds for deciding in advance the direction in which the major fertility drifts will occur, and for moderate numbers (four to eight) of treatments, with as many replicates of each as there are treatments, an arrangement in approximately square formation is employed, with the provision that each treatment occurs once in each row and in each column of plots. Block effects may then be taken out in two directions at right angles. It is again essential that, subject to the restrictions on rows and columns, the allocation of plots should be random. This has proved a most successful and popular method of arranging field plots and has been called the "Latin Square." The problem of calculating the number of possible arrangements has long interested mathematicians. The Knut Vik Square, illustrated on p. 69, is one such possible arrangement, but Knut Vik always used the same design, whereas it is now realized that care should be taken to allow equal probabilities of choosing any one of the arrangements theoretically possible. Within the range of four to eight treatments the Latin Square has proved extremely accurate and reliable. For larger numbers of treatments the accuracy falls off, since plots in the long rows and columns are too widely separated, and it is better to use randomized blocks.

FACTORIAL EXPERIMENTS.

Fisher also developed Johnston's proposal, that two fertilizers should always be tested not merely alone but in combination, into a general treatment of factorial experiments which has opened up many new methods of attack. Thus in a paper on "The Arrangement of Field Experiments" (Ref. 16) Fisher wrote in 1926 :—

> "In most experiments involving manuring or cultural treatment, the comparisons involving single factors, *e.g.*, with and without phosphate, are of far higher interest and practical importance than the much more numerous possible comparisons involving several factors. This circumstance, through a process of reasoning which can best be illustrated by a practical example, leads to the remarkable consequence

> that large and complex experiments have a much higher efficiency than simple ones. No aphorism is more frequently repeated in connection with field trials than that we must ask Nature few questions, or, ideally, one question at a time. The writer is convinced that this view is wholly mistaken: Nature, he suggests, will best respond to a logical and carefully thought out questionnaire—indeed if we ask her a single question she will often refuse to answer until some other topic has been discussed."

If we consider an experiment to test the effect of sulphate of ammonia (N) and superphosphate (P) on potatoes we might, following Johnston, have the treatments,

O, N, P, NP (where NP represents both treatments).

Each fertilizer is thus tested twice, once in the presence and once in the absence of the other fertilizer. For nitrogen we have the responses $(NP-P)$ and $(N-O)$ and for phosphorus $(NP-N)$ and $(P-O)$. The average of the two responses for one fertilizer may be termed its " main effect " and the difference between the two responses for one fertilizer may be termed the " interaction " between the fertilizers.[1] The three comparisons represented by the treatment totals may be split up into the following :—

Main effect of nitrogen . . .	$\frac{1}{2}[(NP - P) + (N - O)]$
Main effect of phosphorus . . .	$\frac{1}{2}[(NP - N) + (P - O)]$
Interaction of nitrogen and phosphorus	$(NP - N) - (P - O)$ $= (NP - P) - (N - O)$.

It will be observed that every plot is used to test each of the main effects, and the experiment will therefore be as accurate as if the whole of the plots had been devoted to either of these questions alone. In addition the experiment uses every plot to test whether or not the response to one fertilizer depends on the amount of another fertilizer or, in other words, gives us direct evidence on the vexed question of " balance " in fertilizers. Where such interactions are not quantitatively important the results are capable of wider general application, for it is then known that the second factor is unimportant and that the results may be applied with confidence to other conditions in which this second factor may be expected to vary. As it is impossible to experiment under all conditions, it is necessary to secure the widest possible basis for any inferences which can be made from experiments. Where the interaction between treatments is a vital feature of the results, much may often be learned about the mechanism of the effects and about the conditions under which the findings should be applied to practice. Thus, if one wished to compare two fertilizers in single-factor experiments one would have to guess in advance the rate, time and method of application to be used, whereas it might happen that the fertilizers would require different methods of application to yield their maximum effects, and it would almost certainly happen that their relative values would depend on the amounts used. If the crop yield is raised nearly to the maximum for the environmental conditions both fertilizers would give similar results, but in the initial steeper portions of the response curves there might be pronounced differences in value which would be missed in single-factor experiments with heavy dressings. Very many of the comparative trials on kinds of fertilizers have given erroneous results through failure to secure at least three points on the yield curve and have thus failed to provide the possibility of comparing the amounts of each fertilizer needed to produce a given increase under conditions in which the crop was still capable of responding to the nutrient under test.

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[1] The " interaction " has recently (Rothamsted Reports, 1934, p. 128, and 1935, p. 142) been redefined as *one-half* of the difference given above. The introduction of the factor $\frac{1}{2}$ has the advantages that in 2×2 factorial experiments the main effects and all interactions have the same standard error, and, in addition, the response to any combination of treatments (*e.g.*, NP or N alone) is expressible as the sum or difference of the various main effects and interactions, without any numerical factors.

An illustration of important interactions which led to valuable practical recommendations may be taken from the first of a long series of complex experiments on the cultivation and manuring of irrigated cotton in the Sudan and Egypt (Ref. 17). The example chosen tested all seventy-two combinations of the following treatments (each repeated four times, making 288 plots in all) :—

	Sowing Dates.	Spacing in rows.	Rate of Watering.	Nitrogen.
I.	July 24	(1) 25 cms.	(A) Light.	(N) Sulph. Amm.
II.	Aug. 11	(2) 50 cms.	(B) Medium.	(O) None.
III.	Sept. 2	(3) 75 cms.	(C) Heavy.	
IV.	Sept. 25			

Fig. 3 shows how the effect of the spacing, watering and manuring varied with the sowing date. For early sown cotton spacing was unimportant because the crop had ample time to grow into large plants which occupied the available space; for late sowing (as *e.g.*, in resowing to replace accidental failures) it was obviously desirable to use the very close spacing. Early sown cotton gave large increases for extra water and added nitrogen, but late sown cotton was much less responsive. Oddly enough the effect of increased water was not affected by the spacing. The response to nitrogen increased with the amount of water supplied and with the closeness of the plants in the row. From such experiments practical recommendations could thus be made which took into account the particular circumstances of individual lots of cotton. These experiments also illustrate a further advantage of the modern designs in that the main results are so consistent and regular that they carry conviction even without reference to the findings of the full statistical analysis.

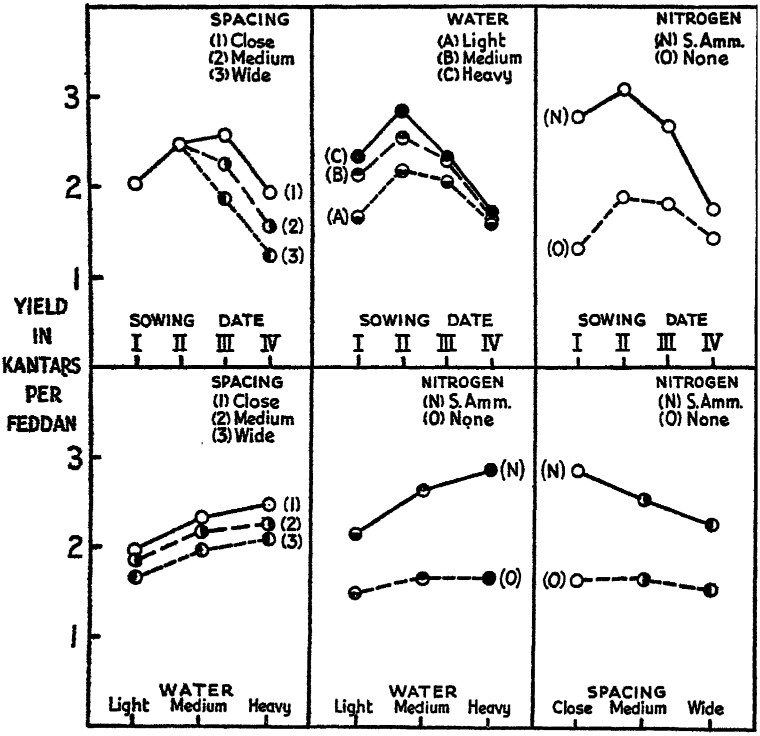

FIG. 3.—Interactions in four-factor experiment on irrigated cotton in the Sudan Gezira.

The advantages of these complex experiments are well appreciated in many parts of the overseas Empire, where it is essential to obtain reliable information on a number of questions as rapidly as possible. In this country their merits do not yet appear to have been generally appreciated, probably because experimenters and practical men are too ready to assume that they know the main effects, and need information only on secondary details.

Experiments with large numbers of treatments lead to large blocks, and several methods have been devised to avoid this difficulty. Sometimes, as in the cotton experiment just mentioned, it is not practicable to irrigate and sow a large number of randomized small plots on different occasions, for the irrigation water would spread from plot to plot. Larger plots are then used to test sowing date and watering, and each of these large plots is subdivided for the subsidiary treatments for which it forms a block. Different factors are thus replicated to unequal extents and comparisons are made with varying degress of accuracy. For example, a popular method in this country, a few years ago, consisted in splitting each plot for some secondary treatment, as for potash versus no potash in experiments comparing phosphatic fertilizers. Since the potash tests were always made on a large number of contiguous sub-plots the general potash effect could be determined with a much higher accuracy than the phosphatic effects.

An alternative method developed by Fisher and Yates depends on deciding in advance that some complex expression of an interaction can be regarded as of secondary or negligible importance and may therefore be thrown out of the experiment by combining it with some difference between blocks.

Thus in the well-known eight-plot test for all combinations of nitrogen against no nitrogen, with phosphate against no phosphate, and with potash against no potash, the treatments might be set out in a series of blocks of four plots as follows :—

(*a*)	(*b*)
O	N
NP	P
NK	K
PK	NPK

Each block, (*a*) and (*b*), has two plots with, and two without, each fertilizer; moreover each fertilizer occurs in each block in the presence and in the absence of each of the other two. All of these comparisons may therefore be made without involving block differences, even though the treatments within the blocks are not identical. But a test of whether the extent to which one fertilizer affects another is itself dependent on the third cannot be evaluated without comparing the whole of block (*a*) against block (*b*) and this comparison is already used to eliminate soil irregularity and may therefore be said to be " confounded " with those for block differences. With careful planning such confounding need cause no serious loss of information, for the particular comparisons sacrificed will generally be those which are believed to be of minor importance and ones which, in any event, are so complicated to express that they could not easily be applied in practice. In more elaborate experiments the confounding may only be partial, and some information may be obtained even for complex interactions.

The example just considered fails to provide information on the important question of the optimal rate of application. A farmer must consider the response in yield against the cost of the treatment given to secure that response, and unless the outlines of the response curve are known he has no means of deciding the most profitable rate of application. In recent years, therefore, experiments planned at Rothamsted have included, wherever possible, both single and double dressings of each fertilizer tested, and sometimes even more rates of application.

This obviously increases the number of treatments considerably; the combination of three rates (0, 1, 2) of three fertilizers requires twenty-seven treatments as compared with the eight for the two rates (0, 1) just considered. On the ordinary commercial farms where such experiments are most urgently needed to determine economic methods of manuring, it is not generally feasible to use experiments with fifty-four or eighty-one plots, giving two-fold or three-fold replication; but the ingenuity of the Rothamsted statisticians in manipulating their powerful tool the "Analysis of Variance" led to a solution of the difficulty which not merely allowed precise results to be obtained from a single replication, *i.e.*, twenty-seven plots in all for twenty-seven treatments, but in addition allowed three blocks of nine plots to be employed to eliminate the major soil irregularities. Each of the nine combinations of any two fertilizers may be evaluated without disturbance by block effects, and, if necessary, the complex interaction between the double dressings of the three fertilizers may be calculated. The more complicated and less interesting interactions are pooled together to provide the necessary estimate of error. It should be noted that the primary question of the effects of any one fertilizer in single and double dressings is derived from nine plots for each treatment. In a large series of experiments of this design carried out in co-operation with the Sugar-beet Factories during the last three seasons it has almost always happened that responses which would be profitable to the farmer have been recognized as statistically significant. As the standard error of a single plot is generally round about 7–10 per cent. it will be realized that such an obvious requirement can very rarely be supplied by simpler experiments with few replicates.

The same design has been used with conspicuous success in a dozen experiments on some 2,000 acres of young rubber trees in commercial plantations on hilly and irregular land in Malaya. There it was impossible to wait until the factors had been worked out one at a time, for the trees would have matured in the meantime, and there was no practical experience to suggest which fertilizer and what rate of dressing was likely to prove most profitable.

Attempts have often been made to improve the accuracy of field trials by "correcting" the individual plot yields by some subsidiary information. Thus, some have proposed to divide the yield of beet in a plot by the number of plants harvested. But it is known that, through the intense competition between plants, the yield is not proportional to the plant number. Others have suggested corrections based on the results of a previous year's uniformity trial on the same plots. This is obviously particularly suitable for trees and bush crops, which occupy the land over a term of years, but its value is less obvious for annual farm crops, since factors affecting one crop (*e.g.*, swedes) are scarcely likely to affect the following crop (*e.g.*, barley) in the same way. As in all branches of field experimentation the merits of the various proposals were the subject of heated controversy until strictly objective methods were devised. Along the same lines as the analysis of variance one may make an analysis of co-variance, using the products of two variables for the same plot, and from this measure, after removing treatment and block effects, the precise degree to which the two variables are related. This factor may then be applied to the yield figures to correct for variations associated with the second variable. With trees the use of a previous year's measurements in this way has led to a very great gain in precision; but for annual farm crops the gain is not worth the heavy labour of harvesting two experimental crops instead of one. It will be seen that the correction applied is determined by the data themselves and not by the experimenter's judgment. Here, as elsewhere, the object of the modern methods is to make each experiment self-contained and independent of other experience; in other words, to obtain facts and not merely opinions.

CROP SAMPLING AND FORECASTING.

In field trials and in commercial farming it is often necessary to draw samples of the produce for measurement, valuation, analysis or other treatment. The problems of dealing with the inevitable variations have recently been attacked statistically along lines similar to those for plot yields as a whole. Repeated tests have shown that an attempt to sample by selecting what appear to be representative samples almost invariably introduces a considerable bias. It is essential that the points at which samples are to be taken or measurements made should be predetermined, preferably by strict randomization, and it is very often desirable that at least two independent random samples should be taken in order that the precision of the sampling should be determined from the variations between comparable samples.

Attempts have been made to develop a technique for estimating the yield of cereal plots from small samples, which can be threshed by hand or in an experimental thresher, in order to avoid the heavy labour of handling the produce of large numbers of lots by commercial machines. Although a really satisfactory technique is not yet available, it appears that Wagner's method of weighing the total produce and sampling for grain-straw ratio and dry weight may be made sufficiently accurate for many purposes.

For sugar-beet factories and for the various Marketing Boards it is becoming increasingly desirable to have estimates of the size and quality of the forthcoming crops. This involves two problems, (1) the sampling of representative areas and (2) a knowledge of the way in which the crops respond to the weather. At present both are attempted by frank guessing by experienced observers, but if there is a general bias the mere multiplication of guesses does not approximate to truth. Something is needed along the lines of those Quaker corn-millers who aroused Wm. Cobbett's wrath in his Rural Ride of August 7th, 1823. It was reported that they :—

> " Sent a set of corn-gaugers into the several counties, just before every harvest ; that these fellows stopped here and there, went into the fields, measured off square yards of wheat, clipped off the ears and carried them off. These they afterwards packed up and sent off to Cropper & Co., Liverpool. When the whole of the packets were got together they were rubbed out, measured, weighed and an estimate made of the coming crop. This, according to the confession of Hodgson himself, enabled these Quakers to speculate in corn, with the greater chance of gain. This had been done by these men for many years."

The modern " crop-gauger " will need to randomize his farms and fields as far as possible and to randomize his samples within those fields.

Useful beginnings have already been made with the second problem of discovering how crops respond to weather. Special plots of wheat have been established at ten centres for frequent measurements at all stages of growth. The variations in weather conditions between these centres have already been successfully correlated with some of the crop observations, and as the series increases and the years pass, it may be possible to use the data for improving the estimates of the expected crop that are made from time to time during the growing season. Quarterly reports on the progress of these experimental crops are published in the *Journal of the Ministry of Agriculture.*

MULTIPLE EXPERIMENTS.

It has now been abundantly demonstrated that reliable field experiments can be conducted on ordinary commercial farms, provided that they are soundly planned and that the laying-out and harvesting are supervised by experienced workers. The next important step is to devise some machinery for greatly increasing the number of these experiments until the main problems are under test in most districts. Each experiment can now be made self-contained, *i.e.*, it will give reliable information to the farmer on whose land it is conducted. The average of a number of experiments under comparable conditions will provide standards by which current practice may be tested and improved and, perhaps most important of all, an extensive series of experiments would provide material for the advancement of agricultural science if systematic attempts were made to discover the causes of the discrepancies between related experiments by studying the agricultural, climatic and soil conditions. The indifferent progress yet made in this country in relating manuring and general soil management to soil investigation, both in the field and the laboratory, is largely due to the paucity of reliable field trials. Farmers who use considerable quantities of compound fertilizers have no means of knowing whether their crops are, in fact, responding to the phosphate and potash they apply. If they leave undrilled strips they will generally observe only the effects of the omission of nitrogen. Soil chemists, on the other hand, may be able to detect deficiencies acute enough to lead to relative crop failures, but they can make little progress for ordinary fertile soils. They lack a collection of soils whose responses in the field have been well tested, and which can serve in the laboratory as standards by which to select suitable analytical methods and adapt them to local conditions.

The value of systematic field experiments on land in moderate to high fertility may be illustrated by the following summary of the fertilizer experiments on sugar beet in a recent year in Sweden.

TABLE I.

SUMMARY OF 179 FERTILIZER EXPERIMENTS ON SUGAR BEET IN SWEDEN IN 1933.

Average yield of beet without fertilizers, 15·2 tons per acre. (With 10 tons dung per acre at two-thirds of the experiments.)

	Nitrate.	*Super.*	*Potash Salts.*
Mean dressing (equivalent British grades), cwt. per acre	3·2	2·2	0·9
Mean response in cwt. roots per cwt. fertilizer	13·0	3·4	2·9
Response required to repay cost of 1 cwt. fertilizer	8·4	3·7	6·6

DISTRIBUTION OF RESPONSES IN CWT. OF ROOTS PER CWT. OF FERTILIZER.

	Number of Decreases.			*Number of Increases.*			
	Over 20	20–10	10–0	0–10	10–20	20–30	Over 30
Nitrate	—	—	1	69	89	14	6
Super (20% P_2O_5)	—	3	56	92	23	5	—
Potash Salts (40% K_2O)	4	19	43	62	35	11	5

Nitrate was generally profitable, superphosphate repaid its cost in one-half of the trials, whilst potash salts were often unprofitable and frequently depressed the crop yield. It will also be noted that the fertilizer dressings commonly used in Sweden are far below those generally recommended in this country, presumably because the Swedish farmers have adjusted their practice in the light of earlier experimental results. Up to the present a much smaller series of experiments on sugar beet in this country has shown even smaller responses, possibly because of a run of dry seasons or because some of the centres chosen had large manurial residues from previous crops. The Swedish workers have already made considerable progress in detecting the phosphate-responsive soils by chemical analysis, but they have not yet solved the problem for potash. Farmer's organizations may well reflect on the wide variations in responses to fertilizers shown in these and in all similar trials and consider whether a small percentage of their outlay on fertilizers would not be profitably spent in arranging co-ordinated fertilizer trials and soil investigations on the continental scale, but with more modern methods both in the actual design of the trials and in the characterization of the soils. In this connection the experience of the cane-sugar factors in Java is enlightening (Ref. 18). There field experimentation grew to such enormous dimensions that there was recently one replicated field experiment for every 125 acres of crop in the country. Now an even more efficient method is being introduced. The soils are first mapped by modern methods of soil classification and survey, individual soils are then analysed for readily soluble nutrients, and a smaller number of more elaborate factorial experiments are conducted on each of the representative soil types so recognized. Finally the findings of these experiments are extended to similar areas of commercial land by means of additional soil analyses.

A comprehensive scheme of field experiments on the varieties, cultivation, manuring and valuation of the principal farm crops would provide the means of co-ordinating the experience of individual farmers and agricultural organizers, and of linking it up directly with all the isolated methods of approach now being made by plant breeders, soil surveyors, soil chemists, pathologists and other research workers, by seedsmen, manufacturers of implements and fertilizers, by the Marketing Boards and other farmers' organizations and by large-scale buyers of agricultural produce, such as the British Sugar Corporation and the brewers.

It is as true now as in 1849, when Johnston wrote the preface to his "Experimental Agriculture," that:

"It is only by means of conjoined experiments in the field, the feeding house and the laboratory—all made with equal care, conscientiousness and precision—that scientific agriculture can hereafter be with certainty advanced. If we have been long in getting upon the right road, we ought to advance the more heartily now we have found it."

E. M. Crowther.

Rothamsted Experimental Station.

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THE CONTROL OF SHEEP TICKS.

I.—General.

The sheep tick is frequently confused with the sheep ked, but these two parasites differ considerably in shape, in structure and in their respective habits of life. Sheep keds (*Melophagus ovinus*) are degenerate wingless insects with three pairs of legs, and they usually pass their entire life cycle on the body and fleece of the same sheep. They are very common parasites and may be found on sheep in most parts of Britain. Keds cause much irritation by their painful bite, and cause damage to wool especially before clipping time; unlike ticks, they have never been convicted of transmitting sheep diseases. Sheep keds are easily controlled by dipping.

Ticks (*Ixodes ricinus*), on the other hand, are arachnoid parasites possessing four pairs of legs (except the immature form known as the "seed" tick which has three pairs) and they undergo a complicated life-cycle, part only of which is spent on the sheep's skin. A tick may be readily distinguished from a ked by its habit of attaching itself firmly by its mouth parts to the sheep's skin, where it may remain stationary for periods up to ten days. The ked also feeds on blood, but it does not anchor itself to one place ; on the contrary it roams all over the body. Generally speaking, the distribution of the sheep tick is limited to upland sheep-breeding areas, and it is found over wide areas in Scotland, the North of England and Wales.

For generations the tick has been regarded as a formidable enemy of sheep and lambs. On infested pastures swarms of ticks attack lambs soon after they are born. The ticks feed on blood, causing irritation, anæmia and frequently septic infections which bring about, directly or indirectly, the death of thousands of hill lambs. Ticks may be killed by dipping the infested sheep, but control in this way is made difficult in practice owing to the peculiar " dropping off " habits of the ticks, as well as by the fact that the main tick season corresponds to the period of advanced pregnancy and lambing. Apart from the obvious damage caused by ticks, they have long been suspected of transmitting the sheep disease known as " louping ill " or " trembling," and recently this surmise has been confirmed by clear and definite evidence. Investigations carried out at the Moredun Institute, Edinburgh, have shown conclusively that ticks not only carry the virus responsible for louping ill, but also transmit an equally destructive disease of sheep known as " tick-borne fever."

Before proceeding to a brief description of these two diseases, it is necessary to outline the life history of the sheep tick which has recently been investigated by MacLeod.

Life History of the Sheep Tick.

When fully gorged with blood and about as big as a garden pea, the adult female tick drops to the ground to lay its eggs at the roots of grasses, rushes or heather. The eggs may number up to one or two thousand. Tiny, almost invisible " seed " ticks emerge from the eggs, and by means of their six legs they climb upon blades of grass, heather or bracken, where in warm weather they await an opportunity of attaching themselves to a passing host. Once on the body of the host each seed tick selects a suitable place and buries its mouth parts in the skin, becoming firmly anchored by the backwardly pointing spines on the hypostome of the mouth parts. When securely attached the seed tick begins to suck blood, and feeds steadily for three to five days without changing position. At the conclusion of this meal it drops to the ground and crawls into a sheltered crevice in the damp earth among the grass roots.

Following a quiescent period of varying length, the seed tick now moults to its next stage, the nymphal stage, and again climbs the vegetation in readiness to attach itself to a passing host. The nymph requires from four to six days to engorge, and when fully fed it also drops to the ground, where after an interval it moults into the adult form, either male or female. The adults reach their hosts in the manner already described for the seed tick and the nymph, and once securely attached the female commences a blood meal lasting from seven to eleven or more days. The male is smaller than the female, darker in colour and does not suck blood, but seeks out the female which it fertilizes while she is actively engaged in sucking blood. When replete with blood the female again drops from the sheep to lay eggs. The sheep tick is, therefore, an example of a " three host " or " dropping off " tick.

Ticks can feed on a variety of other hosts besides sheep, being often seen on cattle, deer, horses, dogs, rabbits and on wild game and vermin. The sheep tick is extremely sensitive to changes in atmospheric temperature and, probably for this reason, the majority of ticks are active only during two limited periods of the year, which have been called the tick seasons. In Northumberland ticks begin to be numerous early in March if the weather is favourable. They increase in numbers throughout April and May, but their numbers generally decline in June, and at clipping time they are very scarce, the warmer weather in June, July and August apparently being unsuitable for them. A second, but shorter, tick season occurs in autumn, during which all stages of the tick are again active on sheep. Occasional ticks have been noted on sheep throughout the year. A spell of cold weather during the tick season, however, such as occurred about the middle of April, 1936, temporarily inhibits their activity and ticks stop coming on to sheep so long as the cold weather continues.

The seed tick and nymph are so tiny as to escape notice unless the short hairs around the muzzle and shanks are examined carefully. Female ticks are easily seen on the ears, around the neck and on the bare skin between the legs and the body. When fully engorged with blood they resemble a garden pea in size, shape and colour. Ticks feed only on blood. They can, however, survive many months without a meal, and in consequence are exceedingly difficult to starve out.

Louping Ill.

Louping ill or " trembling " is a serious disease of hill sheep, and may occur wherever there is rough pasture, bracken or heather to provide cover for the ticks. The disease is common in the Highlands of Scotland and in the border counties of Scotland and England. It is caused by an ultra-microscopic virus which is inoculated into the sheep when the tick bites. The virus, after multiplying in the bloodstream, passes into the brain and spinal cord, destroys the delicate nervous mechanism controlling balance and, after a variable period, leads to paralysis and death of the sheep.

Dullness and a high temperature are the first symptoms of louping ill, and these are followed by excitability, trembling and twitching of the nostrils and lips. If the animal in this stage be unexpectedly disturbed it may leap high in the air and fall back dead, and this characteristic feature of the disease has given rise to the popular name "louping ill." The end, however, is usually not so sudden, and is preceded by a phase of inco-ordinated movement as the nerve cells are progressively destroyed. The sheep gradually loses all sense of balance and lies helplessly on the ground, where the spasmodic paddling of the feet may turn the animal round in a circle before death supervenes. The mortality from louping ill is high, and although recovery is possible, it occurs only in cases where damage to the nervous tissues is absent or slight.

It is of interest to observe that the tick is present without exception wherever the disease has been shown to exist. Ticks from louping-ill farms have been found to be infected, and capable of transmitting the disease to healthy sheep, while several species of animals other than sheep may be infected with louping ill by artificial means.

Ticks themselves do not produce the virus which causes louping ill, but merely act as carriers, and thus it may happen that certain farms are tick-infested, and yet free from louping ill. Clean ticks, however, are readily infected with the virus by feeding on the blood of sheep affected with louping ill and containing the active virus. After fully gorging, falling off and moulting, the tick transmits the virus along with its salivary secretion to the next healthy sheep on which it feeds.

Tick-borne Fever.

Quite apart from the stock which dies from typical louping ill, sheep and lambs on most tick-infested pastures show what is sometimes regarded as a milder form of the disease. It has recently been shown, however, that this is often a separate and distinct disease, resembling louping ill only inasmuch as both diseases are transmitted by ticks. The malady, on account of the high temperature which characterizes it, has been termed "tick-borne fever." Sheep of all ages are liable to be attacked, especially among unacclimatized stock moved to tick-infested pastures during the tick season. In the case of acclimatized stock the baneful effects of tick-borne fever are seen principally in young lambs, these appearing to possess no natural immunity. Affected lambs are dull and quickly lose condition, and it is beyond doubt that this fever predisposes lambs to a variety of other diseases, many of which are fatal. Thus, on tick-infested farms where typical louping ill is scarcely ever noted, the death-rate in lambs during the tick season is often exceedingly high.

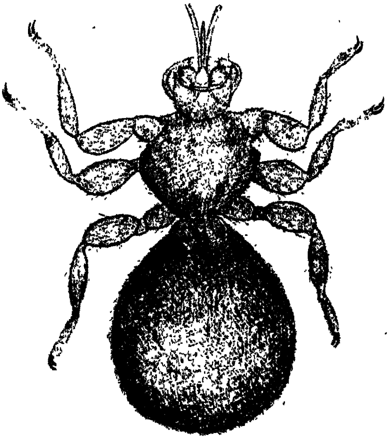


FIG. 1.—The Sheep Ked (*Melophagus ovinus*).

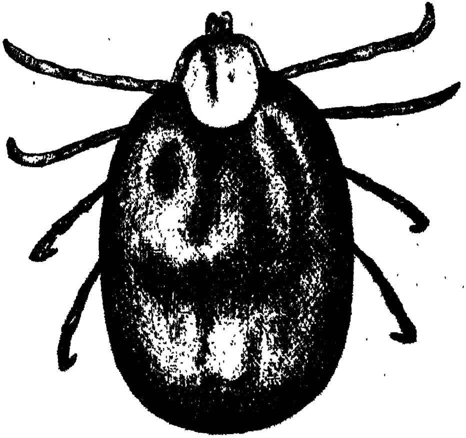


FIG. 2.—The Sheep Tick (*Ixodes ricinus*).

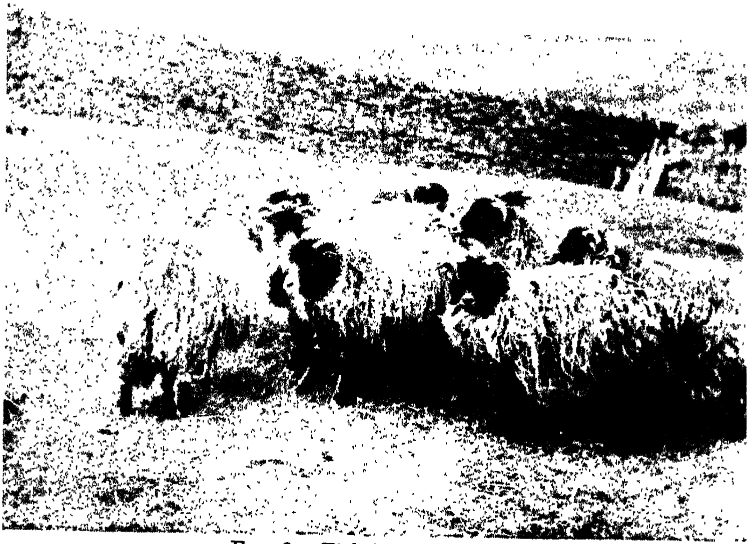


FIG. 3.—Tick-infested Sheep.

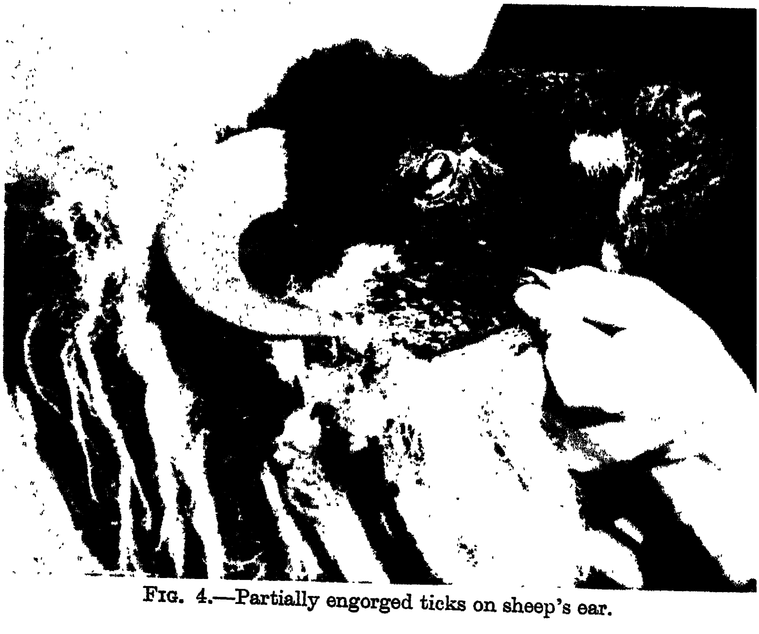


FIG. 4.—Partially engorged ticks on sheep's ear.

Although a variety of end causes, such as crippling, wasting, septic joints, generalized pyæmic infection and pneumonia, appears to account for this mortality, it can scarcely be doubted that ticks are primarily responsible. Certainly these losses have been greatly reduced on farms where an effort has been made to decrease the numbers of ticks by a policy of intensive dipping.

Abortion is a common symptom among pregnant ewes unacclimatized to louping ill and tick-borne fever, and as many as 50 or 60 per cent. of such ewes may cast lamb shortly after grazing on infested pastures. In unacclimatized hoggs or tegs the symptoms of tick-borne fever are marked depression, and the death-rate may amount to 30 per cent.

Far from being a milder condition than louping ill, tick-borne fever is frequently much more serious, and in all probability is responsible for the major part of the losses hitherto ascribed to louping ill. The disease becomes epidemic throughout the lamb stock on tick-infested pastures; blood is infective for ticks throughout the entire period of temperature reaction (which may last several weeks), so that all ticks tend to become infected, with cumulative destructive effects on the stock. Probably the immunity following an attack of tick-borne fever is slight, for it is believed that sheep are liable to repeated attacks; but at the same time native stock is much more resistant to the disease than unacclimatized sheep, indicating in all probability a degree of acquired tolerance or immunity.

An idea of the economic importance of these tick-borne diseases may be gleaned from the following flock histories.

(1) An in-coming tenant moved 143 ewes and 140 lambs, all unacclimatized, to tick-infested pastures in May, 1935. Deaths from louping ill and tick-borne fever commenced two weeks later. The deaths continued throughout the summer and autumn, and by the end of October 230 ewes and lambs, or 81 per cent., had died.

(2) An in-coming tenant moved 200 ewes and their lambs, all unacclimatized, to tick-infested pastures in May, 1934. The death-rate from louping ill and tick-borne fever was approximately 50 per cent.

(3) One-hundred-and-twenty tegs were placed on enclosed pasture fields in March, 1935. Ten days later they were all suffering from an unknown malady, later diagnosed as tick-borne fever. Thirty tegs died. Enquiry showed that the field had become tick infested by the previous tenant's sheep, which had been moved during the tick season from tick-infested pastures.

(4) The writer moved 50 pregnant unacclimatized ewes to tick-infested land in March, 1928. Twenty-six ewes lambed prematurely. In all probability they were affected with tick-borne fever.

Tick Eradication.

The measures which it is possible to employ against ticks have been divided by MacLeod into direct and indirect. Direct methods include the use of poisonous dips, sprays, trapping and burning, etc., which all aim at the direct destruction of ticks, while indirect methods aim at disturbing the balance of those factors which favour the natural propagation of ticks. Draining, bracken cutting and improving pasture through liming, etc., are included under this heading. Moor burning and dipping, however, are the only two methods which appear to possess much value under practical sheep-farming conditions. Burning, although useful in favourable seasons, is not a reliable method of destroying ticks, since the moors in Britain are seldom dry enough to allow the process to be really effective. Commonly, the fire merely runs along the tops of the herbage, with little or no effect on the tick population at the grass roots.

Dipping cattle to control ticks has been practised with success in South Africa and in America, but dipping sheep for the like purpose has not been adopted to any extent in this country. As already noted, the tick season coincides with late pregnancy and lambing time, and on louping-ill farms the general dictum has been that the flock should be disturbed as little as possible at this period. Most farmers admit, however, that dipping at this time causes no harm if it is carefully carried out. At Kielder, the late Sir Francis Walker, Bt. (in conjunction with the Cooper Technical Bureau), dipped his Blackface and Cheviot flocks six times, at five-day intervals, before lambing time, without any apparent injury either to the sheep or the wool. From 1924 to 1926 the Cooper Technical Bureau co-operated with Walton in conducting short-interval dippings on tick-infested pastures in North Wales. Dipping was commenced about mid-May after the ewes and lambs had grazed on tick-infested pastures for about two weeks. It was continued at weekly intervals for six weeks. As at Kielder, serial dippings with an arsenical preparation proved perfectly safe, and throughout the entire experiment no losses occurred from the operation. Total eradication of ticks was not achieved, but the results showed that their numbers were greatly reduced by the dipping, with a corresponding benefit in the health of the lambs. In a private communication, Dr. L. E. Robinson, of the Cooper Technical Bureau, informed the writer that the farmers concerned have continued voluntarily to dip six times, at weekly intervals, with entirely satisfactory results. Walton was of the opinion that the above procedure had practical possibilities for controlling ticks on British hill farms.

Farmers, nevertheless, have hesitated to adopt a campaign of serial dippings, but more recently fresh impetus has been given to the search for the most practical method of tick control by the discovery of the true culpability of the tick in causing wastage and deaths among sheep. Arsenical dips have generally been considered to be the most efficacious in killing ticks, but they do not deter ticks from attaching themselves to recently immersed sheep. Preliminary experiments with standard dips, commenced in 1934, suggested the need for a new type of dip possessing a more lasting deterrent action, and the writer is indebted to Dr. MacLeod for the information that sheep dipped in a mixture of arsenic, carbolic acid and wool grease remained relatively tick-free for a period of nearly two weeks. Their immunity is possibly due to the greasy adherent nature of the dip. Thus in one experiment the infestation in dipped and undipped sheep ran as follows :—

TABLE I.

	Dipped.		Undipped.		
Date 1934.	Numbers of sheep counted.	Average number of adult female ticks.	Numbers of sheep counted.	Average number of female ticks.	Remarks.
April 17	—	—	6	17	The dipped group dipped on April 17th with anti-tick dip.
,, 20	5	1	6	28	
,, 23	6	2	6	31	
,, 26	4	3	6	36	
,, 28	6	5	6	31	The controls remained undipped.
May 1	6	10	6	37	
,, 4	5	20	6	39	
,, 7	6	24	6	32	Both groups were on same pasture.
,, 10	5	32	6	39	

It will be seen that while this dip did not confer absolute protection against ticks, the dipped sheep remained relatively tick-free for about fourteen days, viz., from April 17th to May 1st, at the end of which period the adult female ticks on the dipped sheep numbered ten, as against thirty-seven on the undipped controls grazing on the same pastures. A second experiment demonstrated that the deterrent effect of the arsenic-carbolic acid-wool grease mixture was greater than that of each constituent used separately, although it was not discovered precisely how the mixture exerted its tick-deterrent effects. In view of these promising preliminary results, it was decided to submit this compound dip to more extensive trials detailed below.

II.—NORTHUMBERLAND EXPERIMENTS.

The writer's interest in the subject of tick control began in 1934, as a result of the heavy losses reported among lambs on tick-infested farms in Northumberland. It was stated that for some years scores of lambs had died during May and early June, amounting in some cases to about 30 per cent. of the total lamb crop, and that much additional loss was experienced from a milder, non-fatal type of disease affecting the other lambs. Deaths were known to be due to louping ill and tick-borne fever, but it appeared that losses occurred also from a crippling condition characterized by abscess formation. Since suppurating sores are frequently found after tick-bites, it was concluded that ticks were largely responsible for these septic conditions. Farmers stated that the tick population on sheep and lambs had increased enormously in late years, and that this had been coincident with the appearance of heavy losses from the above causes. While not overlooking the need for fuller information and post-mortem data on these points, it was considered necessary to inaugurate some form of tick control on these farms. Accordingly, after consultation with those interested, it was decided to commence systematic dipping, and an opportunity was thereby presented of testing the new compound " anti-tick " dip on a fairly large scale.

Added importance has been given to the problem of tick control by the results of a survey (undertaken last spring in another connection) of the losses amongst lambs on tick-infested farms. It now seems fairly probable that many pyæmic conditions, such as abscesses on the limbs, spinal cord, and/or throughout the internal organs are caused, directly or indirectly, by the bites of ticks.

Permission was given to dip a portion of the flocks at three-weekly intervals on four tick-infested farms, and to control these dippings by weekly counts of the ticks present on representative sheep, both dipped and undipped. Dippings were arranged as follows :—

(1) The first dipping was to take place three weeks before lambing, eild stock only to be dipped.

(2) The second dipping was to be carried out just prior to lambing, the entire flock to be dipped.

(3) The third dipping was to take place three weeks after the commencement of lambing, all unlambed ewes and eild stock to be dipped.

(4) The fourth dipping was to be done, if possible, during May, the entire flock, including ewes and lambs, to be dipped.

The dipping of eild sheep is not difficult, and by dipping as above it was hoped to keep them relatively free from ticks from March 20th to about May 31st, the approximate duration of the main tick season. Provided that it proved possible to dip ewes and lambs in May, the breeding stock, and more especially the lambs, would receive, it was hoped, some measure of relief from ticks. Lambs become infested soon after birth, but should not be dipped before the age of two weeks. Considerable damage from ticks may in fact occur during this interval but, despite this theoretical limitation, it was felt that the experiments would provide valuable information on the practical value of this method of control. The fourth dipping was not carried out in 1935, so that there was no systematic dipping of lambs. In 1936 the programme was altered and, in place of the March dipping, efforts were made to dip ewes and lambs during May.

The three-weekly interval between dippings was chosen with the idea of combining the effect of the dip in deterring reinfestation (lasting possibly two weeks) with actual destruction of subsequently attached ticks. A fortnightly interval might be even better, but would be less convenient; moreover, as adult female ticks feed continuously on sheep for eight to eleven or more days, the sheep should act as "tick traps" during the third week, conveying the parasites to the bath where they would be destroyed by the action of the dip. In this way it was hoped to prove the practical value of serial dippings.

Throughout the experiments a uniform procedure was followed in making tick counts. Ten sheep from both the dipped and the undipped groups were taken at random, and the head, face, ears and axillæ were examined for ticks, all adult females, both gorged and ungorged, being counted. Counts were repeated at weekly intervals.

Results.

The dip used was presented by Messrs. Robt. Young & Co., Glasgow, and consisted of an arsenic-carbolic mixture, incorporating a natural greasy compound. It was used at a bath strength of 0·17 per cent. arsenious oxide (As_2O_3).

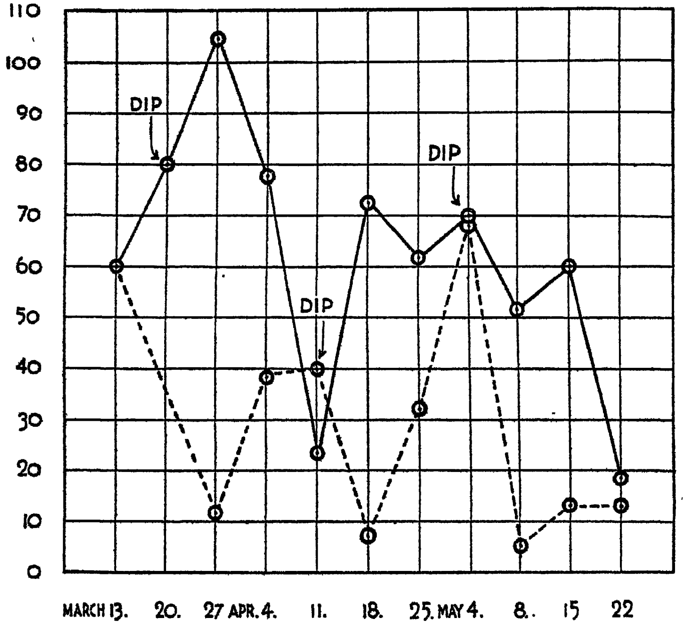
On March 13th, 1935, ticks were found to be numerous on sheep, and the first dipping took place on March 20th. The second dipping was carried out on April 9th and 10th, and the third on May 1st. Unfortunately, systematic dipping of ewes and lambs during May, 1935, could not be carried out, but small experimental batches were dipped without harmful results. The general results are expressed in Graphs 1 and 2. Graphs 3 and 4 show the results of dipping on two farms in 1936. In these flocks ewes and lambs were dipped twice. It will be noted from the graphs for the undipped controls that the increase in tick population during the spring "tick season" cannot be represented by a smooth parabolic curve, constant interruptions being caused by climatic influences. The charted figures refer to averages obtained in weekly counts of ten sheep.

Farm No. 1 was severely tick infested. The dipped flock numbered 240 Blackfaced ewes and sixty hoggs. The undipped sheep ranged over an equally tick-infested area. Losses in lambs in 1934 had amounted to nearly 30 per cent. of crop. Tick-borne fever and septic infections were diagnosed. Serial dippings of the above group commenced in March, 1935. The second and third dippings were carried out according to plan, but ewes and lambs were not dipped during May. The operation of dipping in-lamb ewes was carried out quite safely.

The lamb death-rate in 1935 again amounted to nearly 30 per cent. of the crop. It is probable that these deaths were caused by a number of diseases, but septic infections, tick-borne fever and lamb dysentery were diagnosed in 1935.

In 1936 the stock was vaccinated against dysentery. The first dipping took place before lambing, and ewes and lambs were dipped on May 15th. The total death-rate among lambs was reduced this year to about 7 per cent.

The graph shows how the numbers of ticks on the undipped sheep varied with the external temperature, ticks having ceased to attach themselves during the cold weather which commenced

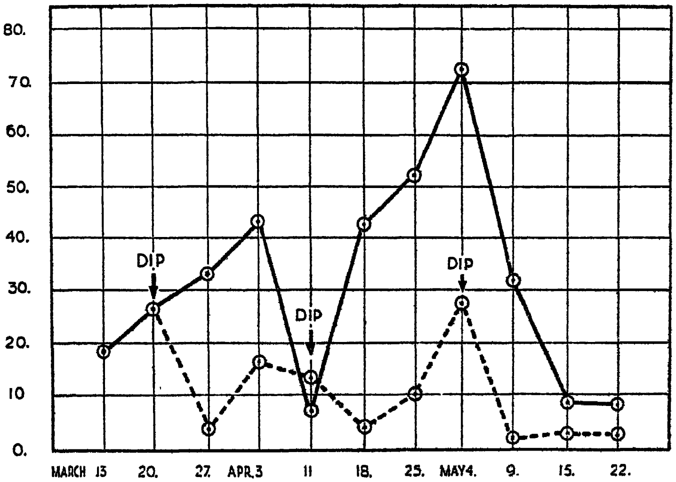


GRAPH I.

Graphical representation of the tick population on dipped flock (broken line) and untreated flock (continuous line) on Farm 1. Three hundred sheep were dipped at three-weekly intervals; the charted figures refer to average tick numbers counted at weekly intervals during the tick season. Two main points are illustrated. Firstly, it will be noted that the numbers of ticks on the untreated sheep varies with the external temperature, and ticks ceased to attach themselves during the cold spell in early April. Secondly, the tick population on the dipped flock is seen to be much lower, while the deterrent action of the dip is noticeable two weeks after dipping.

at end of March. The tick population on the dipped flock is seen to have been much lower, particularly one week after dipping, but also noticeably after two weeks.

Farm No. 2 was less severely tick infested. The dipped flock numbered 460 Blackface ewes and 125 hoggs. In previous years lamb losses during May and June had amounted to about 20 per cent. Tick-borne fever and septic infections were diagnosed. Dipping commenced in March, 1935, but there was no dipping of ewes and lambs during May. On account of severe weather conditions it was not possible to carry out systematic dippings in 1936. The graph illustrates how the tick infestation of the dipped flock was much reduced, as compared with the undipped flock.



GRAPH II.

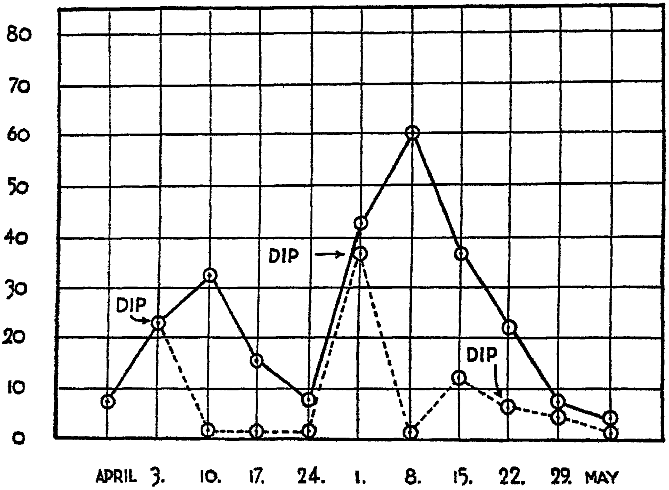
Farm No. 2.—The graph illustrates how the tick infestation on the dipped flock (broken line) was reduced, as compared with the untreated sheep (continuous line).

Farm No. 3.—In recent years ticks have increased enormously on this farm. The stock consisted of 430 Blackface ewes and 100 hoggs. Losses of lambs in 1934 had numbered eighty-three, and in the following year sixty-six. Tick fever and septic infections were diagnosed. Dipping commenced in September, 1934, and was repeated prior to lambing in 1935. Serial dippings of the entire stock (except for twenty control sheep) began on April 3rd, 1936. On April 24th and during the following week, dipping of small batches of ewes and lambs commenced. By May 1st the stock had been twice dipped, excepting the controls and some ewes with lambs less than two weeks old.

The entire stock was dipped a third time, commencing May 20th.

Very young lambs received a setback from being dipped, and dipping was therefore limited to lambs over two weeks. Ewes and lambs were dipped in batches of five, and it was found necessary to re-pen them together for two hours after dipping. This prevented mis-mothering, and lambs sucked a few hours later. Ewes and lambs were dipped together at the same bath strength of dip, and lambs were completely immersed.

As a result of dipping, the stock settled much better than in previous years. The total deaths of lambs during 1936 numbered forty-eight, of which about thirty were due to causes unconnected with ticks. Only three crippled lambs were noted, as against fifteen to twenty-five in previous years. The graph shows how the tick infestation was kept down by the dippings.



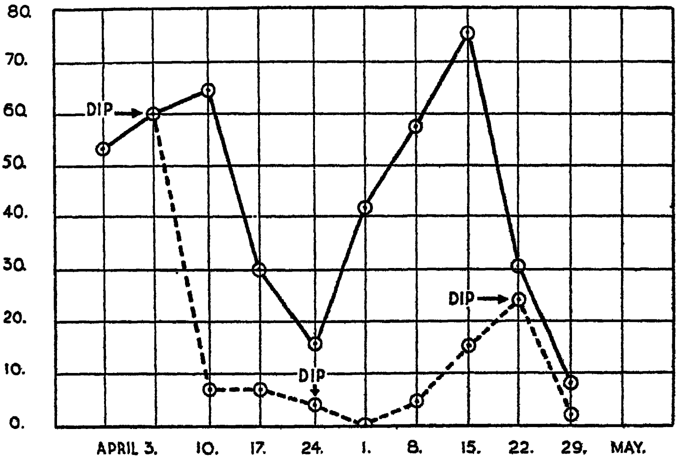
GRAPH III.

Farm No. 3.—Serial dippings of the entire flock (except for twenty untreated controls) began on April 3rd. On April 24th and during the following week, dipping of small batches of ewes and lambs commenced. A third dipping of the entire stock commenced on May 20th. This graph also shows the effect of cold weather on tick activity, ticks ceasing to attach themselves during the cold spell commencing April 10th. The reduction in the tick population through dipping is indicated by the broken line.

Farm No. 4 was severely tick infested. The stock consisted of 220 Blackface ewes and 160 hoggs. An 80 per cent. mortality occurred among 243 unacclimatized ewes and lambs in 1935. Louping ill, tick-borne fever and septic infections were diagnosed. Louping ill was also common in cattle. In November, 1935, seventy unacclimatized hoggs were added to this stock. Serial dippings commenced on April 3rd, the entire stock being treated except a dozen hoggs which served as controls. On April 24th, and throughout the following week, small batches of ewes and lambs were dipped. The entire stock was dipped a third time commencing May 25th, the dippings being completed on May 30th.

Some trouble was experienced in mothering-up the very young lambs after dipping, and as a result several lambs died. This trouble disappeared on re-penning the sheep after dipping, and confining treatment to lambs from two weeks upwards.

The graph shows how the tick population on the dipped sheep was kept relatively low as a result of the dippings. The net effects of treatment on the health of the flock cannot be stated in the absence of previous records for acclimatized stock. Fifteen lambs were reported dead from louping ill and septic infections. Serial dippings of this flock will be continued for several years, or until the tick population is much reduced and the flock shows a satisfactory state of health. Autumn dippings as well as spring dippings will be carried out.



GRAPH IV.

Farm No. 4.—The entire stock (with the exception of suitable control sheep) including ewes and young lambs were dipped on above-noted dates. The graph shows how the tick population on the dipped sheep (broken line) remained relatively low as a result of the dippings.

SUMMARY.

The tick-borne diseases of sheep constitute a serious menace to sheep farming in upland breeding areas, and a large field exists for the elaboration of practical methods for control. Louping ill can be controlled satisfactorily in young sheep (hoggs) by the use of louping-ill vaccine, but so far it has not been found possible to protect young lambs by vaccinating the ewes on tick-infested pastures. On many farms tick-borne fever is an even more destructive disease than louping ill. Moreover ticks are, in all probability, largely responsible for many of the septic conditions which commonly cause much crippling and wasting in lambs. The only practical remedy for both tick fever and these septic infections is the indirect one of reducing the tick population by suitable dipping. Hitherto, it has been considered that ordinary dips possess little or no deterrent action upon reinfestation, but the experiments here recorded suggest that a new arsenic-carbolic-wool grease compound dip has some deterrent effect, observable up to two weeks after use. This dip, known as "anti-tick," seems less quickly fatal to engorging ticks than a good-class arsenical dip, but its effect appears to be more lasting, and its repeated use has no injurious effects on the fleece or skin. Dipping with anti-tick dip appears to be the best form of treatment in outbreaks of tick fever, and affected flocks can be dipped without apparent harm.

On the whole, the actual operation of dipping was followed by no untoward results. Provided ewes are carefully handled it appears that they can be dipped with safety at any time during March, April or May, which period covers roughly the duration of the tick season. Autumn dippings present no difficulties, and the times for these should be carefully chosen to coincide with the second tick season.

The dipping of ewes and their young lambs was found to be quite possible, but troublesome, especially where the sheep must be driven some distance to the dipper. This was carried out successfully on three farms. It was necessary to dip the ewes and lambs in small batches, keeping groups of five in small pens. Where this system was employed there was no mis-mothering, and lambs generally sucked within a few hours. It would appear that lambs under the age of two weeks should not be dipped. Far from harming the lambs, dipping is beneficial, and it is thought that dipped lambs feed better, rest better and, therefore, thrive better. It is as yet too soon to estimate precisely the effect of dipping on mortality among lambs from the tick-borne diseases, but efforts to correlate these will be made in the future.

It is necessary to add that the labour involved in serial dippings of the flock is considerable, and coincides in point of time with the busiest season in the shepherds' year. The only practical alternative seems to be to let the stock go eild for one year, and to dip intensively throughout the tick seasons. Whether one year would effect the desired improvement is a point upon which there is at present no precise information.

Conclusions.

(1) Ticks consitute a serious menace to sheep rearing in upland areas. Ticks transmit the causal agents of two serious diseases,

viz., louping ill and tick-borne fever, while they are, in all probability, also responsible for much wastage in lambs due to septic infections.

(2) A new "anti-tick" dip has been tested, and it appears to act as a deterrent against reinfestation. It is suggested that this dip may be used to control ticks without unduly upsetting the ordinary routine of sheep management.

Acknowledgments.

The original experiments were planned and conducted in collaboration with the Moredun Institute of the Scottish Animal Diseases Research Association, facilities being afforded by Dr. J. Russell Greig, Director of the Institute, and by Dr. John MacLeod. Thanks are also due to the following: to Dr. MacLeod for his valuable assistance in 1935; to Messrs. Robt. Young & Co., Glasgow, for supplying the "anti-tick" dip, and for assistance at dippings; and finally, to those farmers whose co-operation made the above trials possible.

W. LYLE STEWART.

Armstrong College,
Newcastle-on-Tyne.

NOTABLE FARMING ENTERPRISES.—VII.

I.—CAMBRIDGE UNIVERSITY FARM.

(The farms hitherto described in this series have been chosen as examples of able and up-to-date management directed almost solely to the ordinary object of financial profit. This year an exception has been made by including a description of a University Farm.

A farm which is attached to an educational institution presents special difficulties to the person responsible for its management. On the one hand he must aim at providing varied facilities for teaching and experimental work, and he must be prepared, at times, to sacrifice profits to these ends. On the other hand it is not enough to provide a miscellaneous collection of material for demonstration; a main purpose of the farm must be to provide an object lesson in management, and this object lesson will be valueless if the farm is run at a continuous financial loss.

It has sometimes been argued that no single farm can serve the two purposes, and that a choice must be made between them. Cambridge University Farm is, however, well known as, at the least, a very successful compromise. The following account of the farm has been written by its Director, Mr. W. S. Mansfield:—ED.)

The Cambridge University Farm is situated between the Huntingdon and St. Neots roads on the outskirts of Cambridge. Originally three separate holdings, known as Gravel Hill, Howe Hill and Ladysmith Farms, each with its own set of premises, the whole is within a ring fence, and is now organized and worked as one farm having a total area of nearly 700 acres.

It was in the year 1910, with the late Mr. K. J. J. Mackenzie as farm director, that the first of these farms, Gravel Hill, was hired by the Department of Agriculture from Trinity College. This farm then comprised some 250 acres. By 1922, when Mr. Arthur Amos succeeded Mr. Mackenzie as director, the area had shrunk to some 200 acres owing to road frontages, etc., having been sold off for building purposes. Mr. Amos then took over in addition the adjoining farm of Howe Hill, bringing the acreage up to 400. The following year the freehold of these two farms was purchased by the Department with the help of the Ministry of Agriculture. In 1930 the Ladysmith Farm was added by the writer, who had succeeded Mr. Amos as director in 1929. It so happened that all these three farms were in a bad state of cultivation when they were taken over by the Department, being foul, wet and impoverished. The original divisions between the farms are still plainly marked by the condition of the fields. The Gravel Hill Farm, which has now been farmed by the Department for twenty-five years, is clean and in good heart; Howe Hill, farmed for fourteen years, is not yet in such a high state of cultivation; while the condition of the land at Ladysmith, though greatly improved, still leaves much to be desired. The farm is by no means ideal in shape, being long and narrow. The farm premises are such as are commonly found in the eastern counties on farms of this character, being neither better nor worse. A certain number of the buildings are constructed with brick and slate, the balance being wood and tile. It is proposed in the near future to reconstruct them, saving but remodelling all those which are of substantial construction, and erecting a few entirely new buildings, the latter to include particularly a new cowshed and a new pig-feeding house.

The gault clay underlies the whole farm, but upon the northern side old river gravel, varying in depth usually from 4 to 6 feet, but extending in places to a maximum thickness of 20 feet, overlies this clay. Agriculturally, therefore, the farm consists partly of light land (some 80 acres in all, varying from the poorest and hottest gravel to a good gravel loam) and partly of extremely heavy land. The whole of the light and some 220 acres of the heavy land is under the plough, the balance being under grass. Inherently the soils of which the farm is composed are of low fertility; there are not more than 20 acres of what could be described as really good land in the whole 700. The light land is too light, and in a dry season burns badly; the average rainfall is low, being only 22 inches, and spring droughts are characteristic of the area. These droughts often bring to light the great variability of the soil; the depth of worked soil above the pure gravel fluctuates violently between 4 inches and a foot or more, and crop growth is closely related to this depth. Furthermore, the light land of the farm is peculiar in that it consists of gravel and coarse sand with a fair proportion of clay, but very little silt; thus, though it suffers the disadvantages of light land, it is sometimes difficult to work and shows a tendency to run together on the surface. In many cases a very hard iron pan is encountered at a depth of 7 to 10 inches, and this makes subsoiling necessary in preparing for sugar beet. The heavy land is very heavy, a mechanical analysis revealing as much as 50 per cent. of clay. It is characteristic of a wide area of similar land in West Cambridgeshire which bears an unenviable local reputation, and may truly be described as agriculturally depressed. The one redeeming feature of this gault clay is that it contains a fair proportion of lime.

The sharp contrast between these two soil types involves widely different treatment as regards cultivations, rotations and crop varieties. The farm thus possesses particularly valuable features from a teaching point of view. Its contrasting soils are also a great asset to certain branches of research. On many parts of the light land, extremely intricate problems of land drainage arise, since the gravel-clay stratification is often highly irregular. A comprehensive system of tile drains has had to be laid down and this, with the mole drainage which is extensively practised on the heavy land, is also valuable from the teaching point of view.

The first and most important purpose which the farm has to serve is in the teaching of students. With this end in view it is run as a normal working farm with its own separate accounts. As such it affords excellent facilities for the teaching of practical agriculture. In addition to the farm classes which students normally attend, and which are of course held on the farm, the farm is always open to students, who are encouraged to make the maximum use of it. There is a well-equipped farm office where the fullest information on the whole of the working of the farm is made available. In order that the students may be kept in close touch with all that is happening on the farm, and to enable them to take an intelligent interest, special lectures known as "Farm Diary" are given weekly. In these lectures are explained the working policy of the farm, and the lecturer discusses, as they arise, the matters of interest connected with the operations and undertakings in progress, the management of the live stock, and details of working, expenditure, purchases and sales. As the detailed policy of the farm, the plans and intentions, the whys and the wherefores can only be known to the one who is responsible for the management, it is appropriate that these lectures should be given by the farm director. It is by means of these Farm Diary lectures that the agricultural student is given an insight into the business side of his subject, and they form a valuable link between the teaching he receives in the lecture room and the practical application of that teaching.

Among the functions of the farm that of instruction is by far the most important, and the management of the farm is always designed first and foremost with this end in view. It cannot be denied that other functions which the farm is called upon to fulfil do complicate matters considerably, making commercial efficiency very difficult of attainment, yet the teaching value of the farm is always given preference over other considerations.

The farming policy pursued is essentially a system of mixed farming, and though this system has been much abused by some agricultural economists, it is still the one to which Cambridge pins its faith. It has stood the department in good stead during the last ten difficult years, and from a teaching point of view it is clearly a great advantage to be able to demonstrate the production of a wide range of commodities on a commercial scale. The cash value of the output is approximately £8,000 per annum, distributed as shown below ; as the farm is self-supporting from the point of view of live stock, practically all the animals sold having been bred upon the farm, these are net figures :—

	£
Fat Cattle	800
Mutton	900
Bacon Pigs	1,700
Horses	100
Milk	1,400
Eggs and Poultry	600
Seed Corn	400
Other Corn	1,000
Sugar Beet	300
Potatoes	400
Wool	60
Various	250

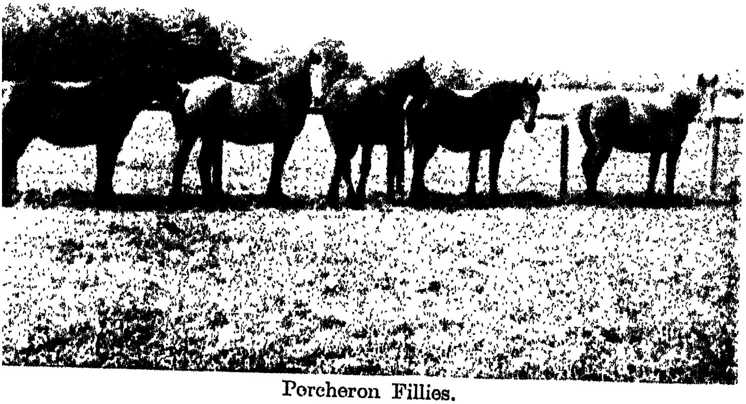
It will be seen that the risks are well distributed, and this is regarded as important in these changing times. The chief items of expenditure are as follows :—

	£
Salaries	260
Wages	2,200
Rent and rates	646
Feeding Stuffs (Cake, Corn and Millers' Offals)	1,900
Artificial Manures	300

The University Farm.

Part of the Dairy Herd. [*Photo, Parsons.*

Half-bred Ewes and Suffolk Cross Lambs grazing on Long Ley.



Percheron Fillies.

It may be claimed that the farm is financially successful. In only one of the last seven years did it lose money—that was in the year 1931–32, when sheep prices collapsed and the balance was £315 on the wrong side. In the other six years profits ranging from £123 to £1,100 have been earned, and these results have been obtained despite a very conservative policy over valuations; these have been considerably reduced, thus putting the farm in a strong position for the future. As an example of the extent of the writing down that has taken place, the case of the poultry unit may be cited. This unit was started in 1930, and a total expenditure on equipment of £1,194 was incurred. To-day this equipment stands in the valuation at £416, £778 having been written off in five years.

Those to whom the diversification of production is anathema may derive some consolation from the fact that the various departments of the farm are sufficiently large to warrant the full-time employment of at least one man; they are in fact deliberately organized as " man units." Thus the size of the poultry unit is such that it furnishes full-time employment for one man, and the same is true of the pigs and sheep. These departments are, however, in no sense watertight, nor is any endeavour made to make them so. The working of all is co-ordinated by the central control of the farm director, under whom is a full-time bailiff. The staff employed is as follows :—

1 Bailiff.
3 Horsekeepers.
1 Poultryman.
1 Pigman.
1 Shepherd.
3 Stockmen.
10 Labourers.
3 Boys.

The work of the farm is done largely by horses, of which there are three teams of four, one stabled at Gravel Hill and the other two at Howe Farm. Many people will regard this as a very unprogressive policy, but none of these critics has any first hand experience of farming really heavy land; nor does it seem to occur to them that it is possible for horses to be a source of profit in themselves. A tractor, however, is also kept and is used a great deal between August and November, at which time the land is reasonably dry, and by it a great deal of ploughing is done.

The horses are of the clean-legged type, and are mainly pure-bred Percherons. At the present time there are eleven pure-bred mares and fillies on the farm, all save two being home-bred. A strong, hardy, active, docile, clean-legged horse, entirely free from any suspicion of grease, is what is required on this land (and probably on all land!), and the Percheron seems to fill the bill. The farm is peculiarly well situated for the breeding of Percherons, for it has the famous stud of Messrs. Chivers as a near neighbour; hence some of the best stallions of the breed in this country are available on its doorstep. It is now some twelve years since the Percheron stud on the University Farm was started through the generosity of the Percheron Horse Society, which enabled the farm to purchase two three-year-old mares on advantageous terms. One of these, the French-bred mare Vasque, is now fifteen years old, has bred nine foals, is still breeding and, except when suckling a foal, is at work every day. Most of the animals at present on the farm are descended from her, and include daughters, granddaughters, and great-granddaughters. Horse breeding is thus quite an important side-line, and not only enables the working teams to be maintained in a high state of efficiency, but has also produced definite profits. The policy followed is to sell the colt foals at the annual sale of the Percheron Horse Society in September, and to retain the fillies. These latter are never housed, but are wintered in some sheltered paddock. They are put to the stallion at two years old, brought in and handled at two and a half and, after a couple of months' light work, are turned away again. At three and a half, having reared a foal, they are brought into regular work in the teams. Breeding from fillies at this early age does not appear to stunt them in any way, and makes it possible to keep them until they are three and a half years old before they are put into full work. It clearly would be very expensive to keep them entirely unproductive until this age, yet to put them into full work on very heavy clay land at a much earlier age has proved to be a mistake.

Three different rotations are practised upon the farm. The first applies only to the 80 odd acres of light land. As this is the only land upon the farm which is suitable for the cultivation of root crops, what is virtually a two-course rotation is practised, roots and corn alternating with one another. In this way just over 40 acres of roots are grown annually. This root area comprises 15 acres of maincrop potatoes and 15 acres of sugar beet, the balance being marrow-stem kale, cabbage, maize and mangolds. The potatoes are followed by wheat, the other root crops by barley. The rotation, with the scheme of the manuring that accompanies it, is as follows :—

1st year	Potatoes	12 loads Farmyard Manure. 3 cwt. Sulphate of Ammonia. 3 cwt. Superphosphate. 2 cwt. Sulphate of Potash.
2nd year	Wheat	No Manure.
3rd year	Sugar Beet	12 loads Farmyard Manure. 2 cwt. Sulphate of Ammonia. 3 cwt. Superphosphate. 1½ cwt. Muriate of Potash.
4th year	Barley	No Manure.
5th year	Kale, etc.	2 cwt. Sulphate of Ammonia. 3 cwt. Superphosphate. 1 cwt. Muriate of Potash.
6th year	Barley	No Manure.

Under such a system of cropping and manuring the land is maintained in high condition, and is kept clean with a minimum of effort. In this way root crops may be grown very economically, and the farmyard manure is turned into money by crops which have a comparatively high cash value. It will be noted that over two-thirds of the root crops are directly cashable. Spratt Archer is the variety of barley that is grown exclusively, a variety bred by Dr. Hunter, now of the Cambridge Plant Breeding Institute. The variety of sugar beet grown is Kleinwanzleben E, and seed treated with sulphuric acid is always used. King Edward and Majestic are the two main potato varieties, but a small area is planted with Eclipse.

The second rotation is utilized on heavy clay fields which, because of their proximity to premises, can be dunged at comparatively small expense, or which, because they are unfenced and without water, are unsuited to leys.

The rotation, with the scheme of manuring that accompanies it, is as follows :—

1st year	Single-cut Seeds followed by Bastard Fallow.	No Manure.
2nd year	Wheat	No Manure.
3rd year	Winter Oats	2 cwt. Sulphate of Ammonia. 2 cwt. Superphosphate.
4th year	Silage (followed by Bastard Fallow) or Beans.	12 loads Farmyard Manure. 6 cwt. Superphosphate.
5th year	Wheat	No Manure.
6th year	Wheat	12 loads Farmyard Manure. 1 cwt. Nitro-chalk. 2 cwt. Superphosphate.

The rotation is thus virtually a three-course, a cleaning and recuperative crop being followed by two corn crops. It will appear that bastard fallowing is relied upon as the only means of keeping the land clean. Up to a point this is true, and in the dry eastern counties, provided no time is lost after the hay or silage has been removed, the land may be kept clean in this way. In addition, however, a great deal of autumn cleaning is practised. As soon as the corn is harvested the stubbles are at once broken up, either by tractor, steam cultivator or "Gyrotiller," and are moved at intervals as long as time and weather allow. Great importance is attached to this autumn cultivation. The corn harvest is always early in Cambridgeshire, and it is unusual not to be able to start breaking up stubbles by the third week in August. On clay land at this time of the year the steam tackle is invaluable, and if a set can be hired to break up 80 to 100 acres, the rest of the work can easily be performed by tractor and horses. During the past three years the "Gyrotiller" has rather taken the place of the steam cultivator on the University Farm, but this is because of a desire to investigate the working of this implement. As regards annual weeds, the chief trouble is caused by black grass (slender foxtail), corn buttercup and shepherd's needle. The ordinary autumn cultivations undoubtedly help very greatly in controlling these, but they germinate rather late for the cultivations to be fully effective, and occasionally a field tends to get foul. A procedure which has proved very efficacious in such cases is to work the land with cultivator and harrows during October and November, and then to leave it unsown until the New Year; the land is usually dry enough to plough some time in January or February, and a plough then will kill many millions of weed seedlings. This ploughing completes the cleaning operations, and spring oats or barley is then sown.

It will be seen that half of the crops grown in this rotation consist of wheat. The land is essentially wheat land, and wheat, clover and beans are really the only crops that are naturally suited to it; of these, wheat is the only one which can be directly cashed to show a profit. When wheat growing is not profitable this type of arable land is almost entirely useless; and, indeed, in the years immediately prior to the introduction of the wheat quota, large areas of similar land in Cambridgeshire and the adjoining counties became derelict. The varieties that are grown are Little Joss on the light land, Yeoman I on the best land, and that in highest condition, and Wilhelmina or Rivett on the remainder, the first two varieties having, of course, been bred at Cambridge by Professor Sir Rowland Biffen, the Director of the Plant Breeding Institute. In 1936 all the oats were Dr. Hunter's new variety Resistance, which came through a very trying winter extremely well.

The single-cut mixture used is as follows:—

Italian Ryegrass	3 lb.
Trefoil	3 „
Alsike	3 „
Broad Red Clover	6 „

This mixture is chosen as it can be relied upon to give a good crop in almost any season. It is generally ready to cut about the first or second week of June, and the hay is largely fed to the working horses during the winter.

The silage is grown to fill a tower silo situated at the Howe Farm premises, where the silage is used principally for young dry stock. The mixture used consists of 3 bushels of beans, 1 bushel of winter oats and ½ bushel of vetches. The seed is sown in the autumn, in wide rows, in the same way as that in which beans are sown. This allows the crop to be horse-hoed once or twice in the early spring; subsequently, when growth starts, it rapidly covers the ground and becomes a real smother crop. For clay-land conditions silage appears an ideal crop; it never fails, a heavy crop can always be relied upon, and it fits admirably into the general economy of the farm. Moreover, it provides a most valuable food, relished by all classes of stock, and the crop forms an excellent preparation for the wheat which it precedes. The above mixture appears, under these particular conditions of soil and climate, to give the maximum weight consistent with standing, and produces a food of high nutritive value. So highly is the crop esteemed that it is intended shortly to erect a larger silo at Howe Farm, and to remove the present one to the Ladysmith Farm.

The third rotation is still somewhat experimental and was started five years ago. It represents an endeavour to adapt to the peculiar conditions of the eastern counties the long-ley system, or alternate husbandry as it is frequently called. This system of farming, familiar enough in some parts of England and Scotland, has never made progress in the eastern counties. The reasons are the cost of fencing and watering and the difficulty of rapidly establishing a thick dense sward under conditions of very low rainfall. In the eastern counties the land does not go down to grass either readily or easily. In this part of the world the laying of land down to grass has always been regarded as a dark and difficult adventure, and nowhere was the old adage that "to make a pasture breaks a man, to break a pasture makes a man," truer than here. While this was no doubt perfectly true years ago, the advent of cheap supplies of wild white clover seed and basic slag has changed the whole situation. With proper management, by using a simple and suitable seeds mixture containing at least 1 lb. of wild white clover, and by the addition of 10 cwt. of high-grade basic slag per acre, it is possible, even on the poor clays of the eastern counties, to establish a very satisfactory pasture both rapidly and certainly in almost any season. This has been demonstrated every year for the past five years on the Cambridge University Farm, and at many other places besides. The rotation as it is being practised at Cambridge at the present time is as follows :—

		Manuring.
1st year	Grass	—
2nd ,,	,,	—
3rd ,,	,,	6 cwt. Superphosphate.
4th ,,	,,	—
5th ,,	Wheat	—
6th ,,	Beans	—
7th ,,	Wheat	—
8th ,,	Barley or Oats undersown with seeds mixture.	10 cwt. Slag.

During the four pasture years the field is grazed heavily with both cattle and sheep. It is broken up in July of the fourth year and bastard-fallowed, wheat being sown in the following November. The seeds mixture which seems suitable is a modified Cockle Park one :—

Perennial Ryegrass	16 lb.
Cocksfoot	8 ,,
Timothy	2 ,,
Rough-stalked Meadow Grass	2 ,,
Alsike	2 ,,
Late-flowering Red Clover	4 ,,
Wild White Clover	1½ ,,

The pastures that have been obtained have excited most favourable comment from the many visitors, whom it is very difficult to persuade that the land is inherently poor and of low value. These new pastures are remarkably productive—far more so than the old permanent grassland—and afford an abundance of keep upon which all stock flourish. Particularly is this the case with sheep, for whom the " clean " land is of special value. No doubt, as time goes on and further experience is gained, many modifications and improvements in the rotation will be made, but even at this stage it may be said without hesitation that the rotation is proving successful. The fields on which it is employed are for the most part remote, and to cart farmyard manure to them would be quite uneconomic. Moreover, the fields are mostly those which were taken over in 1930, when they were both starved and foul. It is difficult to see in what other way it would have been possible to farm them profitably.

The whole of the 300 odd acres of grassland is situated upon the heavy clay, and is divided into fields of convenient size. All the fields are watered, some of them with a piped supply pumped by a windmill from a well in the gravel. At one point where four of the largest grass fields, consisting of 100 acres in all, meet a bore has been sunk through the gault into the greensand below. The gault at this point is about 70 feet thick, and, the greensand being full of water held under pressure, the water rises up the bore to within 14 feet of the surface, from whence it is pumped by a small engine.

In the management of grazing, the aim is to keep the pastures as level as possible throughout the summer. The principle is continuous rather than rotational grazing, although in point of fact pastures are periodically allowed short rests. During June and July, in a normal summer, a few tufts appear, and then the practice of " topping " is followed ; the mower is taken over the field with the knife set as high as possible, which operation does much to maintain an even sward.

A proportion of the pastures, those which are close to the premises and so most valuable for the grazing of dairy cows and working horses, are never mown, but are grazed year after year. The remainder, however, are cut in rotation once in three years, about 60 acres of grass hay being made annually. The policy of setting aside certain meadows for permanent mowing was tried years ago and proved a dismal failure; in spite of generous manurial treatment the grassland in this dry district will not tolerate continuous cutting. Heavy hay crops are not now attempted, and after some years' trial the use of sulphate of ammonia as a means of obtaining these heavy crops has been abandoned. The poorer the soil the more important is wild white clover as a constituent of the pasture; by its aid good productive grassland is obtained, while in its absence the sward is poor beyond belief. In consequence, on this inherently poor land, any treatment that stimulates the growth of wild white clover is beneficial, and any treatment that depresses it is suicidal. By using sulphate of ammonia heavy hay crops were obtained, but at the expense of the wild white clover, which was so largely suppressed that it took two full years and a heavy dressing of basic slag to regain it. In consequence, this practice has been abandoned. Basic slag is the manure *par excellence* for this type of grassland, and the custom is to give a heavy dressing of 10 cwt. per acre every fifth year.

There is no doubt that the most effective (and in the long run the cheapest) method of improving old grass is to plough it up, put it through a short arable rotation, and lay it down again. The accumulated fertility in the sward is sufficient to produce heavy arable crops, and even at present prices it has been found that the whole treatment may more than pay for itself. This method of improvement has been used for several pastures with very satisfactory results, but has not been adopted as a general policy, because it is only really old grass which has a dense enough sward to carry stock under wet conditions; on the heavy land of the farm a pasture must be at least twenty or thirty years old before it can carry stock during a normal winter.

The farm does not specialize in any one particular branch of live stock, nor does it attempt to produce pedigree stock to sell at fancy prices. The aim is rather to maintain high-class flocks and herds of commercial animals, which are sold at market prices either to the butcher or the bacon factory. From the teaching point of view this is considered desirable. After all, the business of the pedigree stock breeder is a highly specialized one, and considerable pains are always taken to impress upon the students that those of them who propose subsequently to farm for themselves (and fortunately there are many) should first satisfy themselves that they are capable of managing commercial stock profitably, before they embark on the difficult pedigree stock business.

Gravel Hill is the headquarters of the dairy herd, the poultry unit and the herd of Large White pigs. Howe Farm is devoted chiefly to beef cattle, calf-rearing and young stock generally, while the accommodation at Ladysmith Farm, which consists simply of three semi-covered yards, is utilized only for wintering the herd of beef cows. The grassland flock of breeding ewes has, of course, no particular headquarters.

In the year 1922, when the late Mr. K. J. J. Mackenzie retired from the directorship of the farm, it was thought wise to dispose of the pedigree herd of Dairy Shorthorns associated with his name. They were replaced by the purchase of some carefully chosen non-pedigree cows and heifers of good Dairy Shorthorn type. The purchase of these cattle was spread over three or four years, and all were bought locally, many coming out of the Cambridgeshire fens. Many of these cows were eventually entered as foundation cows under the Dairy Shorthorn Association's Grading-up Scheme. To-day the herd includes over sixty females, all of them descendants from the original cows and all, of course, home bred. In 1935 the first heifer calves eligible for full registration, *i.e.*, with four top crosses, were born. One of the early purchases, in 1923, was a red heifer, which with her first calf at foot was bought from a dealer in the fens for the sum of £30. She was christened Maud, and proved to be the best purchase ever made by the farm, for she turned out to be not only a remarkable performer but also an exceptional breeder. She bred thirteen calves and won the milking trials at the London Dairy Show in 1931 with a yield of 81½ lb. of milk, testing 5·3 per cent. butter fat, which performance also secured the Barham Cup, given for the cow of any breed scoring the highest number of points in the milking trials. Her best performance was when she was twelve years old, when she yielded 4,000 gallons of milk in one year and eleven months. During her whole life she gave a total of 56½ tons of milk. Her daughter, Cantab Maud 3rd, won the milking trials at the London Dairy Show in 1932, together with the Shorthorn £50 Championship prize. Numerous prizes have been won by others of her descendants, of which there are eighteen in the herd at the time of writing. It is quite probable that within a few years the entire herd will be composed of nothing but the descendants of this one cow. Equally fortunate was the purchase of the first stock bull, Wild Dairyman 2nd, from Messrs. Chivers of Histon. This bull, purchased at eighteen months old, and subsequently qualifying for the Register of Merit, was the sire of many exceptionally good cows, and it is no exaggeration to say that he made the herd. Not only were his daughters remarkable milkers, with shapely udders, but they were also great bodied cows, full of quality, and all showed a remarkable family resemblance. In 1931 eight of this bull's daughters, then in milk in the herd, averaged 1,143 gallons of milk in the milk-recording year. He was followed by another Histon-bred bull, Histon Barrington Prince 4th, who also in due course became eligible for the Register of Merit. Though not such a uniformly successful sire as his predecessor, he yet got some very good cows, one of his daughters, Janet 3rd, winning the milking trials at the London Dairy Show in 1935, and yielding 1,600 gallons with her second calf. Considering that her dam, Janet 1st, was one of the lowest yielders that was ever in the herd, this was no mean performance. The next stock bull, purchased in 1930 and still in use, was Histon Dauntless Foggathorpe 3rd, by that wonderful old bull Thornby Dauntless Dairyman, who died only last year at the age of seventeen. This bull promises to be as prepotent as Wild Dairyman 2nd. His eldest daughters have just completed their first lactations, and have done uniformly well; moreover, they are all of a type possessing shapely udders and being full of Shorthorn character. One of them, Cantab Janet 4th, won the heifer class in the milking trials at the Dairy Show in 1935. A recent purchase is the young bull Histon Wild Prince 34th, by Histon Foggathorpe Dairyman, famous as the sire of so many good cows in the Fotheringhay herd of Mr. Allday. The herd average for the past five years has been 1,083 gallons, and the herd has won distinction in various competitions.

There is little that is at all unusual in the management of the herd. During the winter the cows spend their time in covered straw yards; up till Christmas they are in at night only, but soon after Christmas, when the kale (which is of course fed outside in the fields) is finished, they are in both night and day. The cowshed is thus only a milking shed where the cows come to be milked twice or three times a day, and where the concentrates are fed. This method has several advantages on farms such as this where plenty of straw is available. It economizes labour in cleaning both cows and cowsheds, the cows are much more comfortable, it is easier to discover any cows that are bulling, and at the end of the winter there are yards full of well-made and well-trodden dung available for the arable land, instead of the usual large heap of soiled straw. During the winter thrice-a-day milking is the rule for all cows giving over 5 gallons a day, but only special cows are milked more than twice a day during the summer. The winter feeding consists of meadow hay and kale up till about Christmas, the kale being subsequently replaced by dried sugar-beet pulp. In summer grass provides all that is required up to 4 gallons of milk a day, but as a precaution against drought a few acres of lucerne are always grown, and proved a great boon during the dry years of 1934 and 1935. As the summer advances the grass is supplemented with lucerne and green maize, and by October kale feeding starts again. A number of bull calves from the best cows are sold at birth to farmers for prices between £4 and £8 apiece. The whole of the heifer calves are retained, being sent to Howe Farm to be reared on the bucket, a few cows being kept there to provide the necessary milk. The practice is to allow them about 100 gallons of new milk apiece, and to do them well until they are seven or eight months old. Subsequently they are treated much less generously, receiving only grass if outside, or hay if inside. On no account is any heifer allowed to get fat during her first two years of life. Mating takes place at rather an early age, and the first calf is usually dropped before the heifer is thirty months old. If, under these conditions, the heifer gives about 650 gallons during her first lactation she can be relied upon to give a miniumm of 1,000 gallons at maturity.

Beef has presented all farmers with a difficult problem for the past few years, and the University Farm is no exception. During these years the dairy herd has proved profitable, as also has the ewe flock; but the beef cattle have undoubtedly lost money. Yet it has been necessary to persist with them, if for no other reason than for the sake of the sheep. It has not been possible, even if it had been desirable, for the farm to solve the problem by increasing the dairy herd. Much of the grassland is too remote, and too heavy for the Hosier system to be successful. The only system of beef production which seemed to offer any hope was one which cut down expenditure to a minimum and utilized mainly home-grown foods. Baby beef, which was the type of beef production formerly practised, is clearly ruled out; at 40*s*. per live cwt. it is unprofitable and, moreover, it involves considerable expenditure on cake, corn and labour, and utilizes comparatively small quantities of farm roughages. The solution has been the formation of a herd of about thirty beef cows, calving in the early spring, and each cow suckling her own calf at grass during the summer. Each autumn there is then a really fine bunch of young beef-bred calves, six to eight months old, which can be wintered cheaply in the yards on hay and silage. These cattle then spend the following summer and autumn as stores at grass, are again wintered, this time mainly on straw, and go out to grass yet once again at two years old. During this summer they will get nearly fat if grazed, as they are, on the long leys. They are then brought in and finished off in the yards and boxes in a few weeks, making really first class Christmas beef. With cattle of this description many prizes have been won at the Cambridge Fat Stock Show. On the face of it this seems a very retrograde policy, but it does at least fulfil the conditions previously formulated; and though nobody can claim that it is ever likely to prove a gold mine, it cannot lose money, and provides a means both of converting grass into money and of keeping the pastures in good shape for the sheep.

Several different breeds of cattle have been tried. The essentials are that the cows shall be very hardy and thrifty, capable of breeding calves of first-rate beef conformation, and giving enough milk to rear them really well. At the present time the herd is a "Heinz" one, though the varieties fall short of fifty-seven. It includes, however, cows of the following breeds and crosses: Aberdeen Angus, Beef Shorthorn, Sussex, Shorthorn × Sussex, Shorthorn × Galloway. At the present time these are all being mated to an Aberdeen Angus bull. These cows spend most of their lives at grass, clearing up after other stock. When, however, the heavy land becomes very wet and soft after Christmas, they are brought into yards where they receive a diet consisting mainly of straw.

During the years of depression sheep have proved one of the sheet anchors of the farm. The flock consists of 300 Border Leicester × Cheviot ewes, and is replenished annually by the purchase of ewe tegs in the early spring, usually from Caithness. This annual purchase of ewes is in fact the only purchase of live stock that is made, apart from an occasional bull, ram or boar. Three hundred ewes means one ewe per acre of grassland, and experience has shown that this is about the number that can be permanently carried to greatest advantage; it is small enough to allow of plenty of change of common and prevent the land from becoming stained and contaminated with parasites; on the other hand, it is sufficient, together with the lambs that are retained to feed out during the winter, to provide full-time employment for a shepherd. With the exception of a month when they are folded on the sugar-beet tops, the sheep spend the whole of their lives on the grass. Lambing takes place in March and April, so that the maximum food demands made by the flock coincide with the flush of grass in the spring. A couple of acres of mangolds are always grown to provide for the needs of the flock between the time of lambing and the advent of the grass. With a large ewe flock that is maintained on grass, little seems to be gained by early lambing. It is true that early lambs make more money, but not more than the additional money they have cost, and the policy of spending a shilling to get a shilling is not one that has ever appealed to the writer. Half-bred ewes are notoriously prolific and excellent mothers; 160 per cent. of weaned lambs is the average of this flock. The rams used are Suffolks and, though both Southdowns and Ryelands have been tried, the Suffolk cross lambs, being bigger, have always made the highest prices per head. It is true that the Southdown crosses have commanded about a halfpenny a pound more money, but this has never compensated for their smaller weight. Some of the lambs are sold fat off their mothers. These are the earliest lambs, and are given more generous treatment than the others, receiving some cake and corn through creeps. The remainder of the lambs receive nothing beyond grass and their mothers' milk until after they are weaned. Some of these are sold in July and August as stores straight from the ewes; last year these store lambs averaged 42*s*. The balance, about 200, being the youngest and smallest, are weaned and are got out fat in the autumn and early winter, after folding on kale.

The pedigree herd of Large White pigs was started in 1917 by the purchase of two or three sows of the famous old Ramsey Marie blood from the herd of Mr. Major. It consists of some thirty sows, all of them descended from these original animals. For many generations they have been selected for high fecundity and mothering qualities, and the strain of Large White of which the herd is composed is now remarkably prolific. The sows are distinctly small for the breed, but as they are capable of rearing large litters of thrifty pigs, which attain bacon weight economically at a satisfactory age, there seems little to complain of on this score. Apart from the few gilts and boars that are retained for home use and for sale to a few private customers, the whole of the pigs are fattened out as baconers. During term-time the swill from three colleges is purchased and fed to fattening pigs. Theoretically this is very shocking and unquestionably leads to indifferent grading, but practically it is very sound business! The grading results obtained at the end of a long vacation are in marked contrast to those obtained towards the end of a term! During pregnancy the sows are run in grass paddocks, and are fed a ration of from 3 to 5 lb. a day of a mixture of equal parts of whole maize and whole beans which have been steeped in cold water for twenty-four hours previously. As far as possible, it is arranged for the sows to farrow in batches of ten or twelve. When the sows are within a week or ten days of farrowing they are taken from the paddocks and put on to the tether, each tethered sow being provided with a small movable wooden hut on skids. Here she farrows and remains until her litter is eight weeks old, when the harness is removed and she is returned to a paddock again. While she is suckling her litter she is moved every few days. The little pigs are allowed to run at will over the whole of the grass field in which the sows are tethered, and are given access to suitable food, placed out of reach of their mothers, from three weeks onwards. This tethering system is practised winter and summer alike, and has given excellent results. As the grass fields in which tethering takes place are changed every few months, the ground is always fresh, and the little pigs are free from internal parasites. With this system anæmia never makes its appearance, and after they are weaned and brought into feeding pens the little pigs thrive well. The sixty odd farrows born in this way last year averaged 9·2 weaned pigs with an average weight at weaning of 31·3 lb.

A commercial poultry unit was established in 1930 for egg production on the semi-intensive system. Management is complete, including hatching and rearing. Light Sussex is the breed favoured. These are bred pure during the early part of the season, both cockerels and pullets being reared, and subsequently the Light Sussex cockerels are replaced by Brown Leghorns, the pullets only of this sex-linked cross being reared. The flock consists of 1,000 pullets and about half that number of yearling hens. The pullets are housed during their first season in four large intensive houses. Those that are kept on for a second year are subsequently transferred to slatted-floor portable houses, and are moved about from place to place over the whole farm. Only mature hens are bred from, and these too are kept in slatted-floor houses in suitable lots.

It has been said that this farm is primarily for teaching purposes; it is therefore run as a commercial undertaking, and the claims of other interests are not permitted to interfere unduly with its management. Nevertheless the farm accommodates much research. Special buildings and fields have been allotted to the Plant Breeding Station, the Animal Nutrition Institute, the Potato Virus Disease Section and the Horticultural Research Station. These stations are each equipped with a permanent staff of their own, but the farm provides them with such horse and tractor labour as they require, and for which they pay. Apart from this they are entirely independent and are not a charge upon the farm.

The research which more intimately concerns the farm is the field experimentation. By this is implied the scientific investigation of the actual practices of animal and crop husbandry with the object of effecting improvements in them. New methods are tried out on a field scale, the efficiency of old and well accepted practices is put to the test, and endeavours are made to find the practical application of such discoveries as have been made in the laboratory. As far as possible the policy of this branch of experimentation is to make use of the crops and stock ordinarily grown. This means not only a great saving in money, but ensures that the conditions under which the experiments are carried out are not in any way artificial. Results thus obtained may be regarded with considerable confidence, as being those likely to be obtained under normal farm conditions. Many of the subjects which are at present under investigation are subjects upon which little or no actual work has yet been done, and include an exact study of drainage problems, the effect of cultivations of various kinds, management of and laying down of grassland, and spacing problems with cereals and roots. The ideal has been set not simply of measuring what the effect of a certain treatment has been, but explaining how it is that this result has been obtained and what precisely the effect of the treatment has been upon the plant. This involves careful developmental studies of the plant during the whole season. The results that are being obtained fully justify the time and trouble expended.

In this description that has been made of the management and methods employed on the Cambridge University Farm the writer wishes to make it quite clear that he makes no claims either to infallibility or to any particular originality. He is well aware that his management is open to many criticisms, that neither the system, the farming, nor the methods are unique, and that, fortunately for British agriculture, there are plenty of private farms scattered up and down the country where the farming is at least as good. He does, however, claim that the farm fulfils the purpose for which it is designed, and fulfils it economically. Finally, he would like to add that any success that the farm has achieved is in no small measure due both to the sure foundations laid by his predecessor, Mr. Arthur Amos, and to the valuable assistance so freely given him by his colleagues, Messrs. H. G. Sanders and F. H. Garner, to all of whom he would like to take this opportunity of publicly acknowledging his indebtedness.

W. S. MANSFIELD.

University Farm,
Cambridge.

II.—MR. CLYDE HIGGS' DAIRY FARMS.

FARMERS who have been bred to their trade are sometimes inclined to the view that it takes a lifetime to make a farmer, and that those who come to the industry as recruits, in middle life, rarely achieve much success. Some dispassionate observers of experience, however, doubt this opinion, and the only statistical evidence on the question shows that, on the average, young farmers are more successful, financially, than old ones. Looking back through farming history, we find cases where men have turned from other walks of life and, bringing with them new ideas and fresh capital, have made important contributions to progress. These men have been specially valuable during periods of agricultural depression, when the hereditary farmer's capital and enterprise both tend to run low.

In any case it is necessary to distinguish between two types of recruits. The one has a secure and ample income, is attracted to country life rather than to agriculture, and regards his farm as a means of losing, very regularly but very pleasantly, an amount of money that he can well afford. The other is a man who makes his farming a strictly business concern and puts into it all the thought and energy that he has been accustomed to give to his business affairs. Mr. Clyde Higgs belongs to the latter type.

The history of Mr. Clyde Higgs' farming begins in 1925, when he retired from an electrical engineering business in Birmingham and bought the farm of Hatton Rock, near Stratford-on-Avon, extending to 260 acres. The greater part of the land was arable, corn growing and sheep fattening being the main sources of revenue. The farm was kept in its original form for three or four years, during the early days of the dairy herd. Some 60 acres of flood meadows proved to be rather a liability than an asset, producing only poor quality herbage and failing to respond to treatment; this area was accordingly sold off in 1930. Meantime, however, the adjoining Spring Farm, of 200 acres, was bought in order to provide room for the expanding dairy business; in 1933 the present holding was completed by the purchase of Blacon Farm, situated about five miles away and comprising about 300 acres. These later acquisitions were mainly in grass when they were taken over, and all the arable, both there and at Hatton Rock, was grassed down as soon as this could conveniently be done. The total holding is now, therefore, 700 acres of grass.

The sole object of the business, since its early days, has been to produce, and to supply direct to the consumer, the highest grade of liquid milk. The opportunity of building up a high-class retail milk business was recognized from the start, there being three considerable towns—Stratford-on-Avon, Warwick and Leamington—all within a radius of seven miles of the farms, and each having a rather high proportion of well-to-do inhabitants.

In ten years the daily sales of milk have risen from three pints, which was the first day's achievement, to about 350 gallons. Nothing has been spent on the buying-out of other retailers, and the large business has been built up solely by the efforts of the management. The first secret of success has been to supply an absolutely first-class article, and no pains have been spared to ensure a uniformly high standard of quality and hygiene. Secondly, a good deal of money has been spent, though with care and intelligence, in advertising. Smart vans, smartly dressed vanmen, attractive containers and direct newspaper advertisement have each played a part. Thirdly, the principle that "the customer is always right" has been closely followed, and every effort has been made to provide a service that would satisfy the most exacting. The business is not entirely retail, several hotels and Institutions standing in the books for daily quantities of the order of 20 gallons.

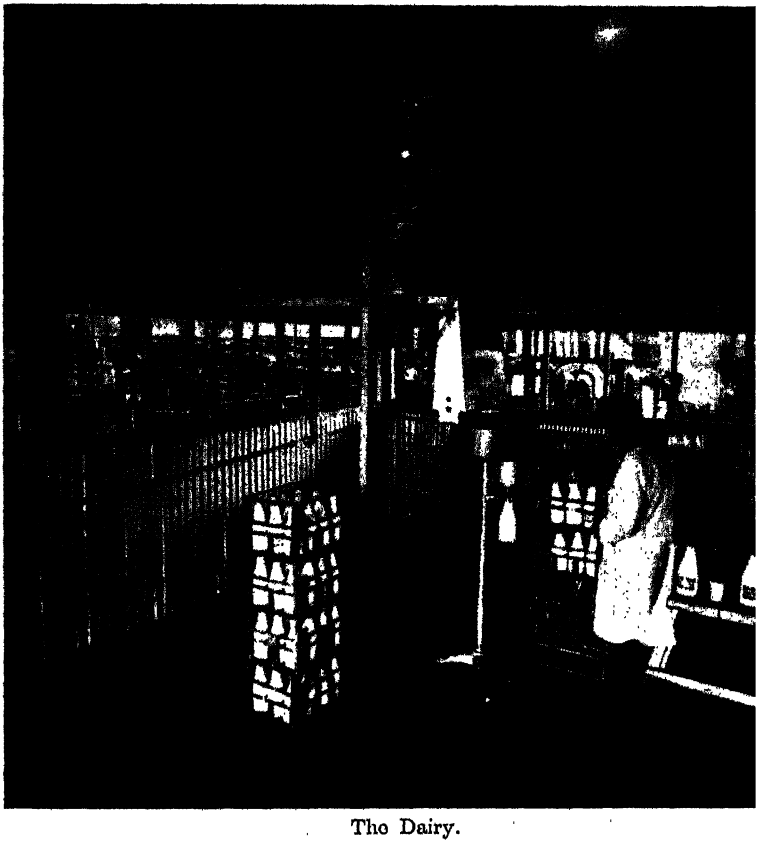
It is well known that the beginner in the milk business has usually to face trouble in connection with production as well as in distribution, and Mr. Clyde Higgs' experience has not been exceptional. He began with commercial Dairy Shorthorn cattle, but (although he had no general fault to find with the breed) he felt obliged to change. The difficulty was merely that of getting, in the numbers required, cattle which could be relied upon to stand up to the tuberculin test. None but tested cattle were bought, yet it was found that many of those purchased reacted to the test a few months after they had joined the herd. Mr. Higgs therefore determined to buy only from herds where systematic testing had been carried on for long periods of years, and it was among the Ayrshire herds of South-Western Scotland that he found what he required. Serious trouble with the tuberculin test came to an end with the change of policy, and pure-bred tuberculin-tested Ayrshires, to the number of about 350, now constitute the only live stock on all three farms.

The second problem was to bring contagious abortion under control. It was still impossible, when the herd was being built up, to buy heifers with a guarantee of freedom from infection, and a considerable proportion of the cattle obtained from Scotland were in fact affected. At the first test 30 per cent. of the herd reacted, and at one time the disease was rampant at Hatton Rock—on one day, indeed, the owner collected four dead and prematurely born calves in his cow pasture. A system of blood-testing was instituted, but it was not until the herd had ceased to depend on purchased females that the trouble was stamped out. Careful routine precautions, which are described below, have so far prevented the recurrence of abortion.

As has sometimes happened, mastitis proved the most troublesome of the " big three " disease problems. The best advice was taken and all the instructions closely followed, yet fresh cases kept cropping up in depressingly large numbers. Almost as a last resort the vacuum used in the milking machine was reduced from 15 to 13 lb., and thereafter progress was very rapid. It seems that the earlier practice of full-vacuum milking was causing the slight damage to the milk-secreting tissue that makes it liable to infection. After the change was made the other measures were quickly effective. The herd is now clear of all three of the major contagious troubles.

Up till 1934 the general scheme of providing food for the cows differed in no important respect from that normally used on grass dairy farms. The cattle went out on pasture during the grazing season, were fed in winter on home-grown hay and purchased cakes, and were littered with purchased straw. In 1935, however, Mr. Higgs installed a grass-drying plant at Spring Farm, the object being to effect a substitution of home-grown for purchased food. He was so well satisfied with the results of the first season's work that he installed a second drier, this time at Blacon Farm, for the 1936 season.

Part of the Dairy Herd.



The Dairy.

Milk Vans and Roundsmen.

Interior of Cowshed. Standings for Washing Cows on the right, Milking Standings on the left.

Concurrently with the building up of the dairy herd a good deal of land improvement was carried on. Upon the whole, the natural fertility of the farms is not high ; they deserve no better description than second-class dairy land. The surface is undulating and the soils very mixed, ranging from what was four-horse clay, in the days when it was arable, to light sand and burning gravels. There was an excessive amount of hedgerow timber, but opportunity was taken, during a short spell of good local demand, to get rid of most of the excess. None of the farms was in good condition when taken over. Spring Farm was easily the worst, for some of the fields were wet, most of the hedges were running wild and a good deal of the grassland was deteriorating, as neglected heavy land in the Midlands will, into a wilderness of brambles, thorns and ant-hills. It was bought at the low price of £15 an acre, but a good deal of money has since had to be spent in draining and clearing. All ditches, ponds and streams have had to be fenced off in case the water in them might carry disease. Again, all the farm boundaries have had to be double-fenced. All the forty and odd fields have been provided with piped water supplies from sources on the farms themselves. Fortunately there were ample supplies of water, all of excellent quality ; the daily requirements, at Hatton Rock alone, exceed 6,000 gallons.

The grass-seeds mixtures used to sow out the old arable have been nothing out of the ordinary : commercial ryegrass, cocksfoot, timothy, rough-stalked meadow grass, and an ordinary quantity of wild white clover have been included in most. A still simpler mixture, consisting of 30 lb. perennial ryegrass, 3 lb. rough-stalked meadow grass, and 2 lb. wild white clover, has given results that are apparently just as good.

With so much by way of historical introduction, let us now turn to the details of the present-day organization.

The land, as already indicated, extends to 700 acres in three separate holdings. Hatton Rock Farm, of 200, is the home of the milking herd. The cattle are brought here as soon as they have freshened, and leave again as soon as they approach the end of their lactations. The normal number of cows in milk is 120, and the average daily output of milk is 350 gallons. The dry cows, as they go out, are sent to Blacon Farm, returning to the milking herd after they have freshened. Each cow, before her return, is closely inspected to see that she is correct in her udder, and is also blood-tested for contagious abortion. In this way it is hoped to avoid reintroducing disease. The milking herd also undergoes routine tests for abortion, and cattle of all ages are of course regularly subjected to the tuberculin test.

Since the sole object of the farms is the production of graded milk (certified until the change of designation and now, of course, tuberculin tested), it may be well to start from the finished article and work back through the various stages of its production.

Five motor vans have each their separate milk rounds in Stratford, Warwick and Leamington. Each vehicle is replaced by a new one as soon as it has done 20,000 miles. Two youthful clerks do all the office work, and attend to the accounts. Each vanman, before he sets out, is given a set of slips with, upon each, the name of a customer and a note either of his normal standing order or of any special requirements that may have been intimated. The vanman has thus no booking to do except in cases where the actual demands of a customer differ from the expectation as set out on his slip. Accounts are sent out to all customers weekly, irrespective of whether they prefer to pay at weekly or at longer intervals. This system has the advantage of reducing the number of complaints and queries arising out of the imperfections of the customer's memory.

The organization of the cowshed staff is worth describing in some detail. There are nine men on the pay roll, but since each gets a whole day off after eight days' duty, the number actually employed on a given day is eight. All cows are milked thrice daily, but each cowman is on duty only at two of the milkings on any given day. As the shifts are arranged, six men carry through the morning milking, while five are available at midday and five again in the evening. The shifts are re-arranged each Sunday so that, for instance, an individual worker will have one week on duty for midday and evening milking, with his mornings free; for the succeeding week he will be on duty morning and evening, with an interval in the middle of the day; the third week he will milk in the morning and at midday, and will be finished for the day by four o'clock. Thus it is possible, in a large farm enterprise, to give something of the same freedom and leisure that workers in other industries regard as their ordinary right. Mr. Clyde Higgs is satisfied that the system is advantageous to himself, because through it he is enabled to retain the services of first-class men who might otherwise be tempted into other occupations.

The cowshed construction and lay-out, and the milking routine, are also interesting. The shed itself is of all-steel construction, being nothing more than four runs of "Dutch barn" units standing side by side. The outer walls are of ordinary corrugated-iron sheeting, and stop short of the roof, the open space serving to admit both light and air. The first range of the shed contains the dairy, including cooler, cold store, bottling plant, etc., none of which equipment is specially elaborate or costly; it also contains the sterilizing and bottle-washing room, where again the plant is of ordinary standard type. The remainder (still of the first range) consists of two rows of standings, constituting what is generally called a "combine" milker. In the first range the cows are washed with warm water and have the fore-milk drawn on to the floor. As soon as washing is finished the cow passes forward into one of the milking standings, where she is milked by a modern type of machine, the milk passing into a glass container. As soon as she is milked out, the cow passes forward and finds her place in her own regular standing. There are six rows of these, each taking twenty-four cows, or 144 in all, equipped with tubular steel fittings and yokes. The total cost of the shed, including standings and milking machine (but not, of course, the dairy equipment) was just over £1,000, or, say, £7 per cow.

A few details regarding the milking and dairy plant may be of interest.

The milk from the machine travels straight from the containers, through the cooler and on to the bottling plant without being exposed to the air. The milk of each cow is weighed automatically, and the yield is recorded at each milking. The boiler is connected up to all the dairy plant, and all utensils are sterilized at 210°F. after each milking. The boiler also supplies warm water for washing the cows. The cooler is worked from a "Freon" refrigerator, which is fully automatic and works with an invisible and odourless gas. A cold-store is operated from the same source. The dairy includes a small laboratory where the milk at each milking is tested for coliform bacteria. A plate-count for total bacteria was also made, until recently, as a matter of routine, but this test has now been abandoned in favour of the methylene-blue reduction test.

The cows' regular standings are equipped with individual water bowls, but have no mangers. The standings are washed down daily with ordinary water, and once a week with a hot soda solution. For the rationing of concentrates Mr. Higgs uses a trolley of his own design which is wheeled along in front of the cows. The trolley contains a mechanism consisting of a drum of such size as to hold 1 lb. 2 oz. of feeding nuts. The drum is operated by a handle, a single turn of which causes a 1-gallon ration to be discharged through a chute on to the floor at the cow's head.[1] Manure is removed by means of barrows with rubber-tyred wheels, and is tipped from a ramp into a wagon which is always waiting to receive it.

In regard to the feeding of the milking cattle, Mr. Clyde Higgs naturally expects to make large use of short dried grass during the winter period, and to make only limited use of purchased concentrates. It will be difficult to lay down any rules about the quantity to be fed, because in practice the quality of the product varies according to the stage at which it has been cut. The contrast between the dry summer of 1935 and the very wet one of 1936 illustrates the difficulty of arranging a drying programme which can be strictly adhered to. In the former year the drying operations had to be suspended during part of July because the growth of the grass had come to a complete standstill. On the other hand, the wet weather of 1936 not only gave an exceptional rate of growth, but produced a material with abnormally high moisture-content, by reason of which the daily output of the drier was reduced quite materially. Some of the grass intended for drying had to be allowed to stand for hay and, in the almost complete lack of haymaking weather, a large proportion was spoilt and some completely ruined. Thus farming, even with the latest inventions of science, is not yet entirely independent of the weather. It scarcely requires saying, however, that Mr. Higgs' position, at the end of the wet summer of 1936, was very favourable compared with that of many other grassland farmers, who had very little good hay with which to face the winter.

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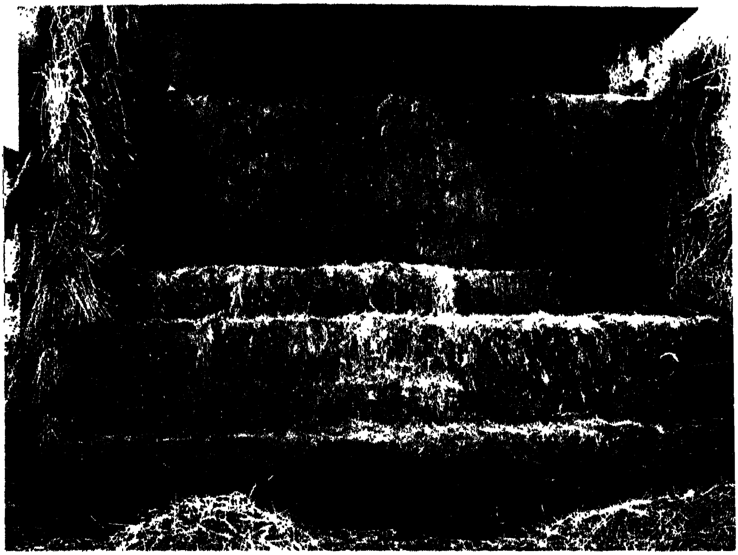
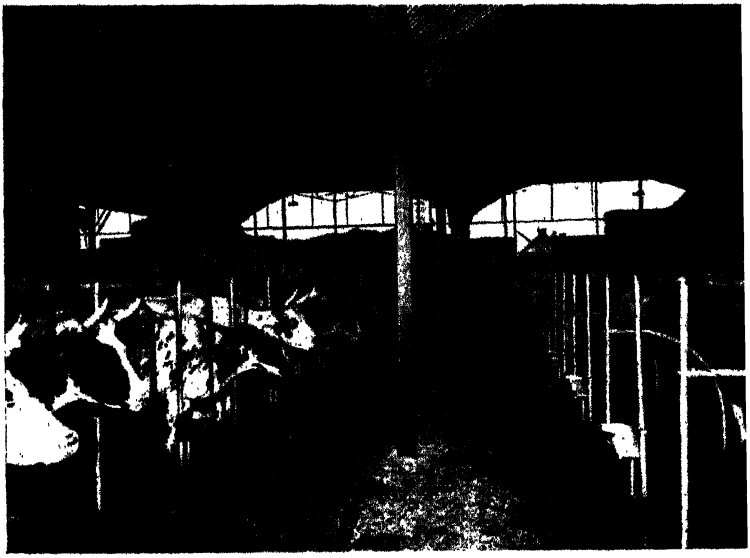
[1] The cows being fed three times daily, three measures of 1 lb. 2 oz., or 3 lb. 6 oz. in all, are fed for each gallon of daily yield.

To return to the feeding, the extent to which dried grass may be substituted for concentrates must depend on the quality of the grass, which in turn depends mainly on the stage of cutting. The material, as it comes from the drier, is batched according to its composition (protein content) so that due allowance may be made for its composition when the time comes for its use. At the time of the author's visits (the autumn of 1936) the system of feeding in use was to give dried grass, but no concentrate, to those cows yielding 2 gallons or less per day. Above this level compound dairy nuts were being fed at the usual rate of 3½ lb. per gallon.

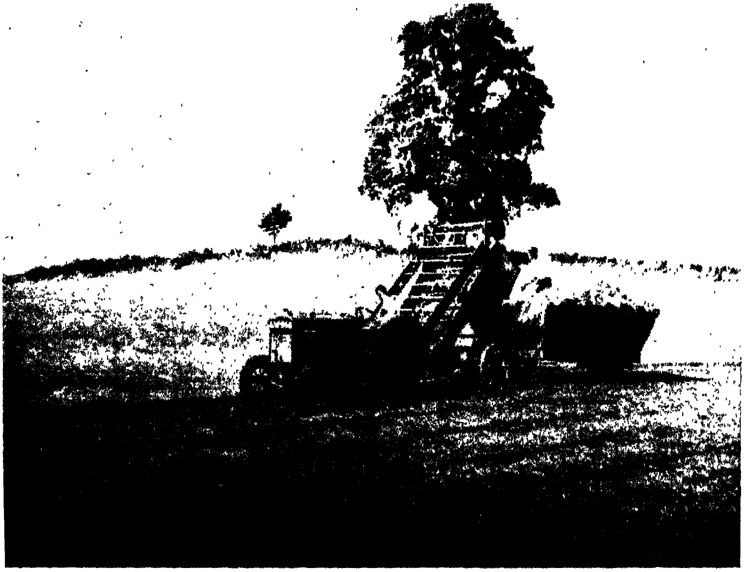
There can be no question that artificially dried grass is an entirely satisfactory food for cows. It is greedily eaten to the last blade. Indeed, it was a striking thing that cows which had first been given some well-spiced dairy nuts and then their ration of dried grass turned immediately from the former to the latter, and returned to the cake only when their grass was finished. Mr. Higgs has been so much impressed with the general merits of dried grass as a food that he goes so far as to say that he would prefer, even in summer, to feed the cattle upon it indoors and turn them out for exercise only. He has convinced himself that he would gain very materially from this practice, not only in total output of milk but in regularity of yield, which is, of course, highly important where high-grade milk is being retailed. The lowest daily yield must be sufficient to meet the requirements of all regular customers, while anything over this quantity must be disposed of in very much less remunerative ways. Hence an irregular output involves serious loss. It is an undeniable fact



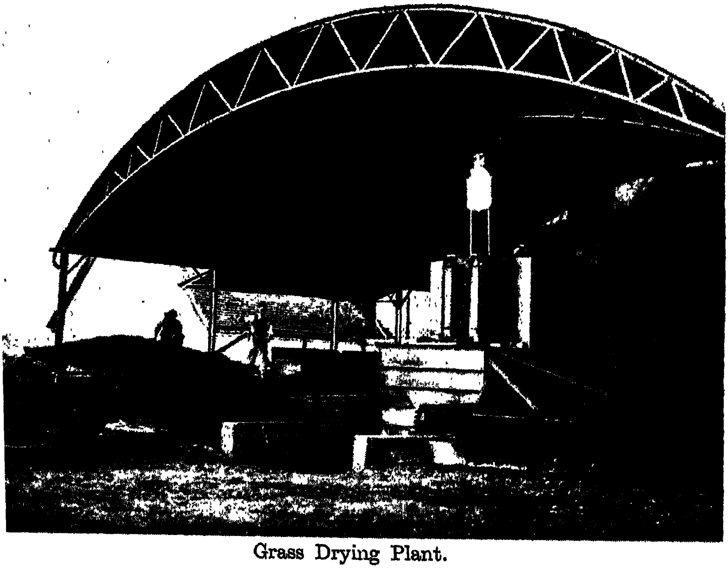
Dried Grass in Store.



Cow Standings.



Cutting Short Grass for Drying.



Grass Drying Plant.

that in hot weather, when cattle are constantly annoyed by flies, milk yields drop very seriously. Whether the advantage gained by keeping the cattle indoors will balance the cost of feeding them upon expensively processed grass must remain an open question. Mr. Higgs has so far no figures which provide an answer. In 1936 the cattle were actually kept in, except for a short daily exercise period, right up till July. It then appeared that the supply of dried grass would not meet the full year's requirements and Mr. Higgs reverted to a system of limited grazing.

Mr. Higgs calculates that 1¼ acres of land, producing dried grass, can be made to keep a cow for a year. This assumes a yield of three tons per acre and an average daily consumption per cow of 25 lb.

The milking cattle are fed during summer three times a day with dried grass, or with dried grass and concentrates ; in winter four-times feeding is the rule. Yields for the preceding week are averaged each Tuesday, and the rations are adjusted, according to individual yields, on the following day.

Dry cows, or those which are approaching the end of their lactation periods, are, as already indicated, removed to Blacon Farm and are kept there until they are calved and seen to be correct. There is no intensive "steaming up" of the cattle, the normal ration for the two or three weeks before calving being equivalent to that for a 2-gallon or, at most, a 3-gallon cow. All bull calves are disposed of within a few days of birth to a buyer who contracts to take the whole at a standard price. The heifer calves born to date have all been retained, so as to form a reserve of down-calvers and thus insure against the risk of having to buy in cattle for replacements. In the past two years, however, the number of heifers in sight has risen above any reasonable estimate of future requirements, and it would be safe to make some reduction. Whether this will be done by selling heifer calves at birth, or by disposing of bulling or down-calving heifers, is a point as yet undecided. On the one hand a smaller number to rear would mean a larger amount of milk to sell at what is, of course, a high price ; calves reared on milk that could be sold at sevenpence a quart are necessarily expensive animals. On the other hand it is an undoubted advantage to be able to cull the batches of heifers before they join the milking herd. So far, indeed, Mr. Clyde Higgs has been very fortunate in his stock bulls, and has not had the experience of having to get rid of whole batches of heifers on account of their failure to fill the pail.

All heifer calves are dishorned, by the use of caustic, as soon as the horn buds appear. At first only partial success was achieved, because it was found that the treatment, to be certainly effective, had to be so severe as to cause bleeding. The result was that the flowing blood carried the caustic on to the skin below the horn buds, and caused occasional ugly and painful sores. The practice now is to smear vaseline over the surrounding area of skin before the caustic is applied, and regular success is now obtained. Ayrshires without horns are not entirely pleasing to the eye of the fancier, but in a large milking herd into and out of which strange cattle are continually being drafted, the great advantage of hornlessness is undeniable.

Calf-rearing has been done until lately on the pail, a number of cows being set aside to supply the milk required. Recently, however, there has been some change-over to suckling, and results seem if anything to favour the latter plan. After weaning, at eight to ten weeks old, the calves are reared on dry meals, hay and cake. Last winter the experiment was tried of rearing a batch on milk and dried grass only, while a control pen received hay and concentrates. It is doubtful whether any real difference could be observed after the calves had spent a subsequent summer at grass, though certainly nobody could have maintained that the grass-fed calves were inferior.

After the calves have reached a few months of age they are made up into batches and, in summer, run at pasture either at Blacon or at Spring Farm. In winter the younger lots are housed in ordinary open-fronted sheds, while the older lots run out. The heifers are mated at eighteen months to calve down at two and a quarter years old.

A mineral mixture in powdered form is provided for all the cattle. For lots on grass it is placed in iron bowls on the pastures. The growing heifers consume large quantities, and it may be that the practice has something to do with the high standard of health throughout the herd. The cows consume much smaller amounts of minerals, especially when they have liberal rations of dried grass.

We must turn now to the grass-drying business. The fields used to produce the material are partly old turf, which has been improved to a greater or less degree by slagging, etc., and partly land recently sown down. The preparatory manuring which has so far been adopted is simply an application of 1¼ cwt. per acre of Imperial Chemical Industries No. 4 Complete Concentrated Fertilizer. This is given during the winter or early spring. Later in the season, after either the first or the second cut, the practice is to apply 1 cwt. per acre of nitro-chalk.

It is often suggested that applications very much heavier than these will be necessary to keep land in good heart under the severe drain of repeated cutting. Indeed, if one makes a calculation of the nitrogen removed in the form of cut grass the figure is rather alarming. Three tons of dried grass with about 16 per cent. of protein (which is a rough estimate of Mr. Clyde

Higgs' yields) will contain about 170 lb. of nitrogen per acre, equivalent to nearly 8 cwt. of sulphate of ammonia or 11 cwt. of nitro-chalk. But there are two other items to enter before the balance sheet is completed. Firstly, the dried grass is consumed on the farm and the manure goes back to the grass fields. Secondly, the sward is by no means pure grass, but contains a very high proportion of wild white clover. The ultimate effect of repeated cutting on the character of the sward is still a matter for speculation, but on Mr. Clyde Higgs' land the tendency, after two years' cutting, is undoubtedly towards an increase in the proportion of clover. Nor can this be regarded as surprising, for it is known that early spring grazing, by removing the competition of the early grasses (ryegrass in particular), has the effect of favouring the later-starting clover. Early spring cutting must have the same effect. Indeed, the appearance of the repeatedly mown fields seems to suggest that, if anything, the proportion of clover may get too high, in which case, of course, only a very light cut would be obtained in the early spring.

It is an interesting observation that the cows are quite alive to the difference between a good and a poor quality of grass even in the dried form. They show a marked preference for the clovery herbage of the highly improved land, whether this be fresh or dried.

Apart from this tendency towards an excessive proportion of clover (which may indeed have been due to the peculiar character of the season), the swards when seen by the writer seemed to be improving under their new treatment. The sown swards, where the land had been clean and the seed had taken well, were extraordinarily dense, velvety, uniform and remarkably free from weeds. There seemed to be no call for any kind of mechanical treatment such as winter harrowing. The old grass fields, which had carried very poor swards, also seemed to be improving markedly. At Blacon Farm especially, where there had been little time for slag and hard grazing to show an effect, the botanical composition of the grass had been definitely improved by the first season of repeated mowing.

The organization of the actual drying operation is simple. The labour force consists of five men. The drier is ordinarily kept running for twelve hours daily. Two men cut and carry the crop, one driving the tractor and the other loading the trailer. The tractor and trailer go out to the field, the trailer is hitched behind a Wilder "Cut-lift"[1] machine, and cutting proceeds until a full load is obtained. The machine is then left standing while the tractor takes the load to the drier.

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[1] Mr. Higgs had originally some misgivings about the "Cut-lift" mower, as the design seemed to him to be open to criticism, especially by reason of its side draft. The first machine has, however, cut over 500 acres, has given no trouble, and has required no more than ordinary attention in the way of oiling, etc.

Two men attend to the drier, and a third bales the dried material with a hydraulic press, weighing, labelling and stacking the bales as they are made. With grass in average condition it is found that the two men employed in cutting and carrying can provide as much material in seven hours as the drier can deal with in twelve. The two men who provide the grass are therefore able to relieve the others for meals. Normally, cutting goes on from eight till twelve and from two till five o'clock, while the drier runs from 7 a.m. to 7 p.m.

Mr. Higgs has tried running the drier, with double this staff, for the whole of the twenty-four hours, the tractors being equipped with head-lamps for night work. On the whole, however, this system is not favoured.

The baler makes a handy-sized bale of about 90 lb., which is tied with three wires and is sufficiently solid to withstand ordinary handling.

The farm power consists of two rubber-tyred Fordson tractors which are replaced, on a part-exchange basis, each year, and two horses only. Tractors are used for such work as hay-mowing and hay-sweeping. Mr. Higgs has experimented with the "ten-pound car" for haymaking, but found this, in the end, more costly than the light tractor. The tractor is again employed for dung carting, the staff consisting of three men. All three work together in loading, and the muck is spread directly from the trailer by two while the third drives, at a slow and steady pace, over the field. The whole operation was carefully costed in the winter of 1935–6, when the cost of carting and spreading came to 1*s.* 3*d.* per ton for a 15-ton dressing and a half-mile haul.

The dairy stock of the farm, which of course represents the greater part of the tenant's capital, is valued on an automatic system according to age and milk yield. The heifer calves are put in the books, at birth, at £3 per head and £1 is added for each month of age. The value at twenty-seven months, the normal age for first calving, is thus £30, which is probably fair, considering that all the cattle are tuberculin- and abortion-tested. If and when the animal attains a lactation yield of 800 gallons the value is raised to a maximum of £35. If the yield fails to reach this figure, or subsequently falls below it, the book value is reduced at the rate of one shilling for every gallon of deficiency. Thus a 600-gallon cow stands at £25 and a 400-galloner at only £15. The average value of the milking herd, as calculated on this system, is fairly stable in successive valuations at just under £30; and the overhead average valuation, including heifers, at slightly more than £20.

A general inspection of the farm left a highly favourable impression of the management. The cattle were neither fat nor lean, but in uniform, thriving, store condition. The grass land, whether grazed or mown, was in good or, at least, improving condition. Above all, the workers were obviously as keen and interested as their chief, and there was a general air of thorough, quiet efficiency throughout the whole enterprise.

J. A. Scott Watson.

School of Rural Economy,
University of Oxford.

SYSTEMS OF HOUSING FOR PIGS.

Many opinions have been expressed by writers, and many more remain unwritten, regarding the success of the Pigs Marketing Scheme as measured by the financial return to the farmer. It may safely be concluded that the margin of profit to the farmer, with recent prices for bacon, has been small, and that very little has been required to put the balance on the wrong side. Skilful management of every factor at every stage of the production of bacon pigs has been necessary to ensure a profit. The basic price for pigs, the carcase weight and the grade determine the gross return obtained from each individual animal, but the net return is a question of the efficiency of the management. It is obvious that the basic price must be reasonable in the sense that it should cover the cost of efficient production. Granted this essential starting point, then it is equally obvious that the higher the standard reached in such factors as the average number reared per litter, the weight at weaning, the food consumption per lb. of live-weight gain and the average grade, the greater is the probability of good financial results. Good breeding, skilful feeding and good housing may be regarded as major points in successful management. Further, it may be claimed that suitable and well-constructed buildings are an essential prerequisite if optimum results are to be obtained from successful breeding and feeding.

Recent years have seen a marked and growing improvement in the housing of pigs, which improvement has been definitely accelerated since the introduction of the Marketing Scheme. Statistics have recently been published showing the amount of bacon and hams going into cure each month for the last two years. These figures show clearly that monthly deliveries during the first four months of the year are much below the average, and it has been considered advisable to offer an additional bonus for pigs delivered during these months. There may be a number of reasons for the low output in these months, but it is suggested that lack of suitable housing is a major factor. In other words, it must be difficult, if not impossible, to arrange and carry out all-the-year-round farrowing and feeding, and therefore to produce even deliveries, without suitable and efficient housing.

It is the purpose of this article to attempt to describe briefly some of the types of housing and systems of management adopted in this country.

The type of housing to be used will, to a large extent, be determined by the general system adopted, which must be considered in relation to the location of the farm and, to some extent, the nature of the soil. Farmers whose holdings are situated in high, exposed situations, or on heavy, wet, retentive clays will probably not be attracted to a wholesale policy of outdoor production.

There is fairly general agreement that dry sows and growing gilts should be run outside wherever conditions allow. They can be bunched in age groups and run in convenient paddocks or woodlands. A simple hut gives all the protection required, provided it is sufficiently large and well built to give all the pigs shelter and a dry bed. A water supply and a dry feeder complete the equipment necessary for this section of the herd. If the supply of meal in the dry feeder is limited to one day's ration it ensures that the pigs will be seen at least once a day. It is advisable to place the dry feeder some little distance from the water supply, since this arrangement ensures that the pigs will take some exercise and prevents any congestion round the feeder; while some are feeding others are going to or coming from the drinking water.

FARROWING.

Which system and which type of housing should be adopted for farrowing sows? To this question the answer must be that no particular system or house will suit all conditions. Most systems have points in their favour and also points which can be argued against them, and there are also individual likes and dislikes to be taken into account. Farrowing and rearing up to weaning age may be carried out entirely on an indoor system, or entirely on an outdoor system. Again, a compromise may be adopted, the sows being farrowed indoors, particularly in winter, and moved out, with their litters, when the piglings are a week or more old.

Outdoor farrowing.

The most obvious advantage of farrowing and rearing to weaning age out-of-doors on grassland is that healthy stock will be reared. To obtain the maximum benefit, the grassland must be green and fresh and the stock must be moved to fresh land at more or less frequent intervals according to the system in use. The pigs get exercise, fresh air and sunlight, and, having access to fresh green material and soil, they should not, provided the ration is otherwise well balanced and adequate, suffer from mineral or vitamin deficiencies. Trouble from anæmia and some forms of scour, which are frequently found where an entirely indoor system is in use, is practically unknown where young pigs have access to fresh, clean ground. If the breeding stock is good, and has been carefully selected for mothering and milking abilities, then losses in rearing should be small under this system and weaning weights at eight weeks old should be high; average weaning weights up to 40 lb. are not uncommon, at least during the greater portion of the year. Against these marked advantages it has to be admitted that, owing to the scattered area over which the pigs may be running, the labour costs for attention and feeding are likely to be greater than where farrowing is carried on inside in well-constructed, convenient buildings. The actual increase in labour costs varies with the particular type of outdoor system adopted, and reference will be made to this point in describing the various systems. Again, farrowing results, or rather numbers weaned, may be relatively unsatisfactory during the worst of the winter months, especially in cold or exposed positions, for it is extremely difficult to get the huts up to the degree of warmth that is desirable during the first few days after farrowing.

SYSTEMS OF OUTDOOR BREEDING.

1. *Huts in small permanent grass enclosures.*—This system, which was more common some years ago than now, has not stood up to the test of experience. The grass runs are apt to become foul and muddy, especially during periods of wet weather. Except on the driest soils the pigs wallow about continually in a mud-bath, especially in the neighbourhood of the house and food troughs. The growth of grass becomes rank, especially in summer, is generally inefficiently grazed and calls for labour to keep it out. More serious still, parasitic infection often becomes very high and the pigs suffer seriously in consequence.

Where a system of permanent enclosures appears the only possible one, the runs should be of fair size, and either alternative runs should be provided for each house or else a number of enclosures should be provided sufficient to ensure that they may be rested in turn, and possibly grazed with other stock such as sheep. Light, dry land would appear to be the main essential for such a system.

The advantage of the system is that fencing, water supply, etc., are more or less permanent and the time and cost involved in moving are eliminated.

2. *Portable huts with fenced runs*, all being moved at intervals. The essentials in this method are a well-made portable type of hut, sufficiently large to accommodate the sow and her litter, with some form of fencing which can be easily taken down and re-erected in a fresh position. The hut should be constructed of well-seasoned timber and be draught-proof. The door should be placed in one corner, so as to avoid any direct draught. The roof may be of good weather-board, asbestos sheeting or felt or corrugated iron with an inner lining of timber. A wooden floor should be provided and the hut mounted on runners or skids to facilitate moving. Where a number of huts are in use they should be placed in line, so as to save fencing. A sufficient area is fenced to form a run for each hut. The runs are moved at intervals, the time being determined mainly by the size of run and type of soil. A common practice is to move two or three times a year. The objects should be to prevent the land becoming foul and to secure its even grazing in rotation.

Fencing may be of various types. Special pig fencing with welded joints is on the market, and this may have barbs incorporated. Heavy-gauge sheep fencing, with a small mesh, is also said to be satisfactory, and a strand of barbed wire a few inches above ground level is generally desirable. Apart from its first cost, the suitability of the material for taking down and re-erection has to be borne in mind.

The cost of the portable huts varies according to type and material and may range from £6 to £10. Fencing costs also show a wide variation, but a suitable fence can be erected at about 1*s*. 6*d*. per yard.

Fig. 1 shows the system in use on Lord Lymington's Farleigh Estate. An account of his methods has already been published (Ref. 1). An interesting point in that description is that, when the huts and fencing are moved forward, the land vacated is used to run the dry breeding stock, the outside fences being preserved.

A somewhat more elaborate system, but again entirely moveable, is practised by Mr. H. R. Davidson, and a short account of it, with illustrations, has been given by Reid (Ref. 2).

3. *Folding units* :—A number of different types of fold units have made their appearance on the market in the last two or three years, and illustrations of two makes are given in Figs. 2 and 3. The fold unit consists of a house about 8 feet square, to which is attached a run the same width as the house and 10 or 12 feet in length. Fig. 3 shows the runs extended, by the introduction of hurdles, to 19 feet in length, which allows a greater area for exercise.

These units can be used either for a sow and her litter or to run on weaned pigs for some weeks before the final fattening period. The units may be used either on grassland or for folding on arable. They should be moved at least once daily and, though devices are available for moving some makes by manual labour, the moving is essentially a job for a horse, and the house should be fitted with skids.

One advantage of keeping the pigs under this method is that, in addition to having fresh air and sunlight, they are moved on to a fresh, unsoiled area at least once a day and infection with parasites is thus reduced to a minimum. A second advantage is that the units may be placed in any field, irrespective of its size, and no fencing is required. If moving is done regularly the land should not be poached, and the folding brings about a marked improvement in the herbage, particularly on poor, thin, dry soils.

To be weighed against these advantages there is the labour and cost of moving the fold units, which requires the employment of a man and a horse for a given period each day. Another point is that the area allowed for exercise to the sow and litter is definitely limited and is often too small by the time the little pigs are five or six weeks old. The extension of the run by inserting extra hurdles, as shown in Fig. 3, is a definite advantage.

While the principle is the same in all the various types now on the market, these vary in the details of their design and construction. Most fall within a price range of £10 to £12, but price should not be the only factor determining the choice. The unit sits out in all weathers and is intended to be moved every day, so that it is essential that it should be well constructed of sound timber; a "jerry built" unit of light timber is not likely to have a long life.

Provision should be made for the young pigs to feed separately by means of a creep, and this should be under cover. The drinking trough should be carried on the unit itself, so as to avoid the necessity of moving it separately. The house should be built of such material and of such a size that, fitted with proper means of ventilation, it is warm and wind-proof in winter and yet cool in summer. It is a further advantage to have a portion of the run covered in some way, in order to provide a place where the sow and litter may lie in warm weather with some protection from the sun. Shade can easily be provided with some light battens and sacking.

4. *Tethering* :—This system consists of placing a set of leather harness on the sow and tethering her by a chain. The chain is generally some 30 feet in length, one end being fixed to the harness and the other to an iron stake driven into the ground. A portable hut, on skids, is placed in such a position that the sow can only just reach the inside when the chain is

fully extended. This arrangement prevents her from going right round the hut and becoming entangled.

The sow should have her harness put on about a fortnight before farrowing, in order that she may, before she is due to farrow, become accustomed to the restriction of movement. Where a sow is being subjected to this system for the first time it is recommended that a spring link should be inserted between the harness and the chain in order to avoid any sudden jolt when the chain becomes taut.

As soon as farrowing commences the chain is unfastened from the harness and thrown outside. The chain may be left off until the sow becomes a nuisance to her neighbours, which may probably happen after three or four days; it is claimed that, after this stage, the little pigs will not be injured by the chain. The sow can be fed from a trough which is fixed to the side of the hut, but some farmers prefer to feed the ration in the form of nuts spread on the grass. A supply of water can be provided by means of a trough fixed on the outside of the hut. A number of huts can be placed in one field, so arranged that the sows cannot reach each other. The area over which the sows range is limited, but the small pigs enjoy free range. The huts are moved forward a distance of 10 yards or so each week or at other suitable intervals. The young pigs from the various litters mix with each other, and may be fed from a dry feeder placed out of the sow's reach. It is claimed that by this method the young pigs start to eat earlier, the older litters teaching the younger.

The advantages of the system are, again, the access which it provides to fresh air, sunlight and clean ground. Compared with the folding-unit system, the exercise of the sow is still limited, though to a lesser extent, but the young pigs are free to run about. Boundary fences have, however, to be considered, for unless these are efficient the small pigs may stray on to adjoining cropped land or on to roads. A criticism sometimes made against the system is that sows may be sucked by pigs other than their own. Opinions differ as to whether this is a serious drawback; doubtless the answer will to some extent depend on the amount of variation in the size of the litters and the milk yield of the individual sows. The harness and chain are inexpensive, and, with simple huts, the whole equipment cost is low. Where it fits in with the general conditions of the farm there would seem to be much to be said in its favour. With a certain amount of boundary fencing this method, like the fold-unit system, could, if desired, be employed to some extent on arable ground.

Fig. 4 illustrates this system in use on Cambridge University Farm.

FIG. 1.—Portable Huts and Fenced Runs on Lord Lymington's Farleigh Estate.

FIG. 2.—Fold Units in use on University of Reading Farm, Sonning, Berks.

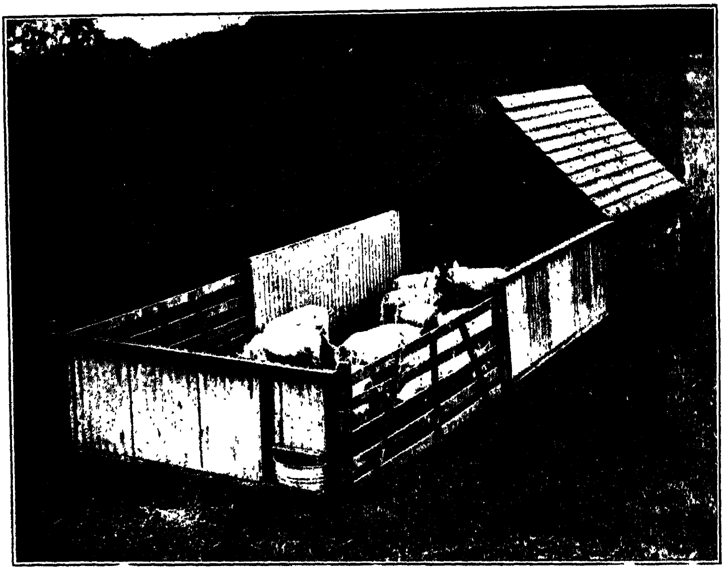

FIG. 3.—The " Trobridge " Folding Unit in use on the farm of Mr. S. H. Hart, Checkendon, Reading. The run has been extended to 19 feet by the use of hurdles.

FIG. 4.—The Tethering System in use on Cambridge University Farm.

INDOOR FARROWING AND REARING.

It has already been pointed out that an indoor system of farrowing and rearing may be, and often is, associated with troubles like anæmia and scour, which arise because the pigs have no access to fresh ground and green food. On the other hand it cannot be argued that indoor farrowing must of necessity be associated with these troubles, or that they cannot be overcome. A number of successful breeders do all their farrowing and rearing indoors and, by taking the necessary precautions combined with skilful management, carry on with reasonable success. Facilities for exercise and fresh air can be provided by means of concrete yards or runs attached to the breeding house. Green material can be fed, and recent work by Baskett (Ref. 3) and others has shown that a large measure of control over anæmia can be obtained by painting the sow's udder with a mixture of iron sulphate, copper sulphate and treacle.

An indoor farrowing system has many points in its favour, especially if a large number of sows have to be dealt with. In the most convenient lay-out, the sows to farrow and those with litters may be housed in one or two large houses. On the assumption that the building has been well designed, the labour requirement is at its lowest, or, considered from the other angle, a man can look after a maximum number of pigs. Food and water are within reach, feeding can be carried out easily and quickly, and nothing has to be carried any great distance. The pigs are grouped together within close compass, can be seen frequently and receive any attention necessary. Farrowing crates, which are useful in the case of difficult sows, may easily be fixed in such a house. Finally, some form of artificial heating may be installed which may be of great service during the cold months. The writer's opinion is that many of the losses which occur among piglings during the first twenty-four or forty-eight hours after birth are due to insufficient warmth. Some method of providing extra warmth during the first day or two after birth, when necessary, will prove of very great benefit.

Indoor farrowing houses may take many forms, but commonly consist either of a single row of pens or of double rows of pens with or without outside runs. If a single row is used the feeding passage will be along one wall, while if a double row is used the feeding passage may either be central or along each wall, the pens in the latter case being back to back. This latter arrangement, although it increases the width of the house, means that no pens are in contact with outside walls. It also allows a heating system, running up the centre and available to all the pens, to be conveniently installed. Fig. 5 shows such a lay-out at the Agricultural Research Institute for Northern

Ireland, and Fig. 6 shows a concrete yard adjoining that building. This yard provides exercise for sows and litters and in it a rack is provided in which green material may be fed. An account of these buildings, with plans, has been published (Ref. 4).

Farrowing pens are generally 9 feet × 9 feet or a little larger, and farrowing rails are generally fitted about 10 inches from the floor and 10 inches from the walls. Opinions vary as to the necessity for farrowing rails, but a majority of farrowing pens or huts are still fitted with them.

Arrangements should be provided in the pens to enable the young pigs to start feeding early apart from the sow. This means railing off a portion of the pen in such a way as to allow the young pigs access to a trough while excluding the sow. A "hover" may be placed in each breeding pen, so that the young pigs can lie in a warm corner away from their mothers. The "hover" consists of a wood framing in one corner of the pen with a layer of straw on top. One or more pens in the farrowing house may be fitted up with farrowing crates, so that a sow may be farrowed in a crate if desired and, after a few days, be transferred to one of the ordinary pens.

OUTDOOR VERSUS INDOOR.

The writer's preference is very definitely in favour of some form of outdoor farrowing and rearing wherever possible. An attempt has been made to state briefly some of the points which may be put for and against each of the systems so far described. It is suggested that the increase in health and vitality generally obtained with outdoor reared pigs outweighs the possible drawbacks to such systems and that, given reasonable soil and climatic conditions, the outdoor system is to be preferred. Pigs reared under such conditions should pass on to the fattening house ready to "go ahead." It is, however, by no means certain that a compromise would not give the best results. There is general agreement that it is best to farrow and rear pigs outside during the good months of the year; but there is a good deal to be said for having a house with just sufficient pens to accommodate the winter farrowing sows for two or three weeks, moving each to an outside hut when her litter is a week or more old, the actual time varying according to the weather conditions. Farrowing inside during the worst months makes it possible to keep the pigs dry and to supply that additional warmth which, it has already been suggested, is desirable at that time. It would appear, therefore, that an inside "maternity hospital" might well form a useful part of an otherwise entirely outdoor system.

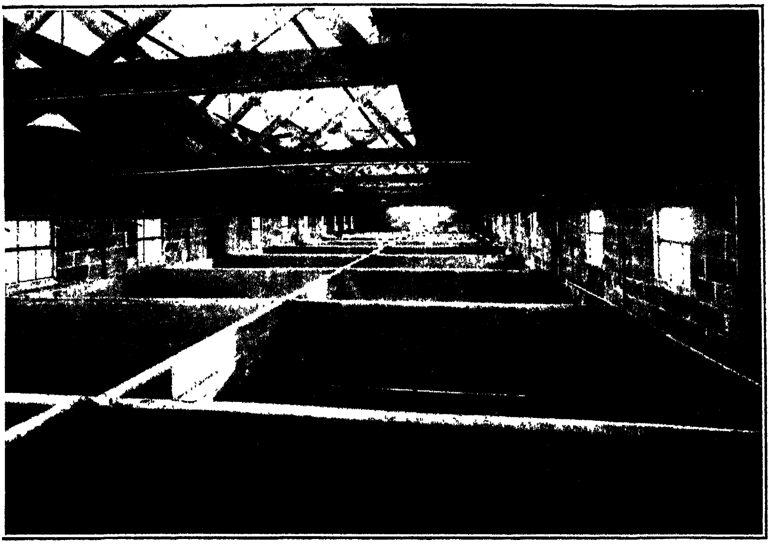

FIG. 5.—Interior of Farrowing House at the Agricultural Research Institute of Northern Ireland.

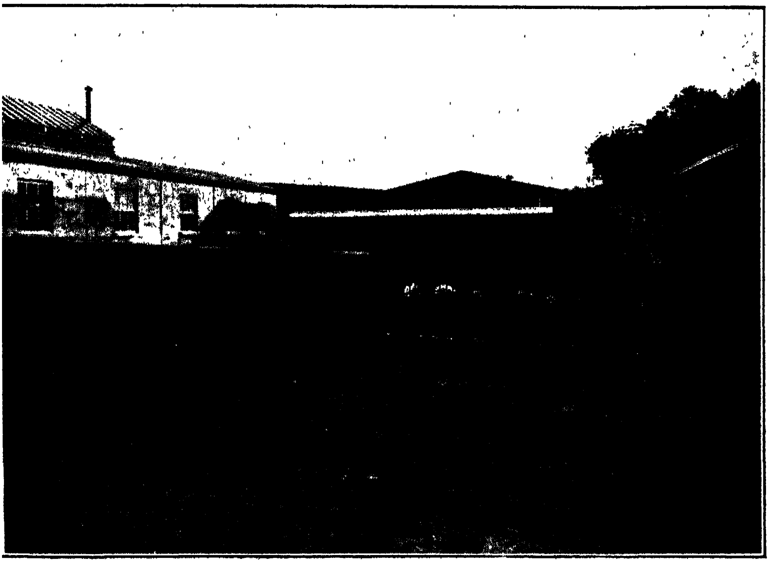

FIG. 6.—Concrete Yard adjoining Farrowing House at the Agricultural Research Institute of Northern Ireland.

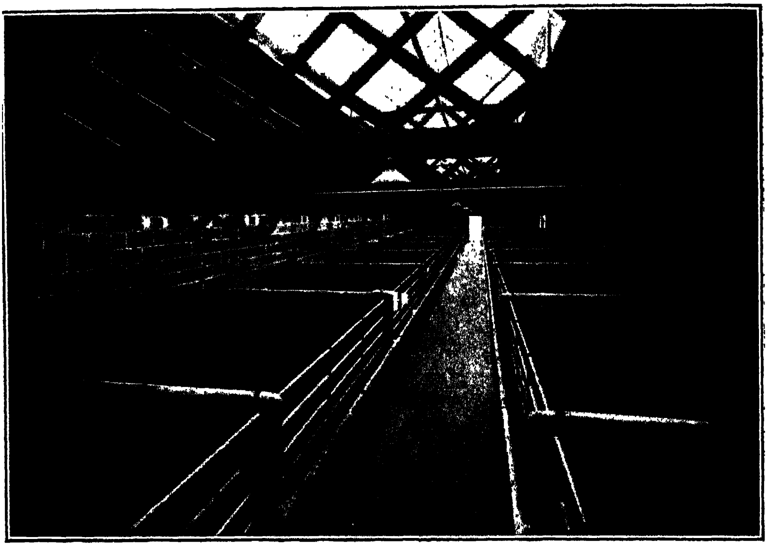

FIG. 7.—Interior of Fattening House at the Agricultural Research Institute of Northern Ireland.

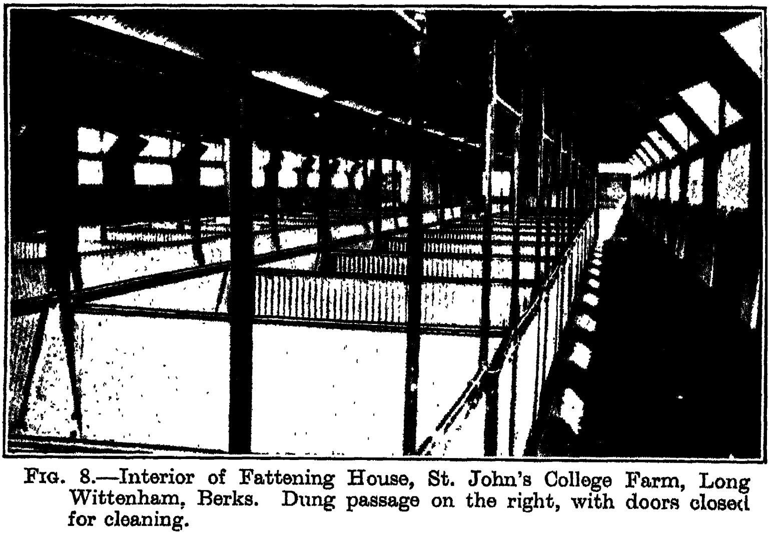

FIG. 8.—Interior of Fattening House, St. John's College Farm, Long Wittenham, Berks. Dung passage on the right, with doors closed for cleaning.

HOUSING OF BOARS.

Boars may be housed in pens or boxes by themselves, but should be provided with a yard in which they may take ample exercise. If boars are housed in adjoining pens the partition walls should be strongly constructed and about 5 feet high.

As an alternative, some breeders run the boar with the sows and gilts in a paddock. This has the obvious disadvantage that unless great care is taken it is difficult to record exact service dates. Another method is to keep the boar in a small paddock with a hut in it, either by himself or with one in-pig sow for company. In this case the outside fencing must be sufficiently strong to keep him in.

FATTENING HOUSES.

The systems of housing so far described have been those suited to sows and their litters up to weaning age. Where pig production is carried out only on a relatively small scale, some of the housing described, as, for example, the fold units, could be used to carry the pigs on to bacon weights. Again, when numbers are small, portions of farm buildings such as loose boxes, small sties, yards and so forth will doubtless be utilized for the fattening pigs. Where, however, numbers are large and pig keeping is a definite unit employing the full-time labour of one or more men, there is general agreement that results during the fattening stage will be better if a specially constructed house is used.

Before discussing this type of housing in detail some reference should be made to the age at which pigs are to be drafted to the fattening house. In some cases pigs are taken to the fattening house at weaning, and remain there until despatched to the factory. In others an "intermediate" period, varying from four to eight weeks or sometimes longer, is allowed, after which the pigs are moved to the fattening house for the finishing period of two or three months. Strong opinions have been expressed in support of both these methods, but there is a lack of precise information and it is one of a number of points in management which call for experimental investigation. The "intermediate" period must not be confused with a store period, as, in the short life of a bacon pig, there is no time for such a period and the animal must be kept going all the time. During this "intermediate" period the pigs are generally run in groups of, say, twenty to forty and may be housed in a number of ways. They may run in fold yards in the farm buildings or in concrete yards made for the purpose, probably in close proximity to the fattening house and with shed accommodation built in the yard. They may also be run on grassland, clover aftermaths or lucerne, with portable huts. Use can also be made of fold units for this purpose and, if the length of run is extended by the use of hurdles, two or three weaned litters can be run together in one unit.

The advocates of this "intermediate" period may admit that a slightly lower daily live-weight gain may prevail during the intermediate period, but claim that the pigs are healthier and that, when they eventually go to the fattening house, they make rapid and unchecked progress up to bacon weight. They also claim that, when the average daily live-weight gain from weaning to slaughter is calculated, and the average cost per pound of live-weight increase is taken, pigs finished on this system compare very favourably with pigs placed in the fattening house at eight weeks old. For the other system, claims are made that the live-weight gains are better and that economy of labour in attention and feeding is achieved by having all the pigs together in one house.

The Construction of the Fattening House.—There is probably greater agreement on the type of building suitable for fattening purposes than on any other point in pig housing. A fattening house should be built on what is generally known as the Danish or Scandinavian plan. This may involve the erection of an entirely new building or it may be possible to alter or convert an existing building for the purpose. While many conversion schemes have been eminently successful and have resulted in a considerable saving in capital expenditure, others have been less fortunate. Any conversion scheme should be carefully thought out and considered in detail as regards situation, aspect, ventilation and so forth. There are cases on record where, after the spending of considerable sums of money, the results as measured by the health and general "doing" of the pigs have been so poor that the building has had to be abandoned.

A fattening house on Danish lines may be built on the farm by contract or direct labour and may be constructed of concrete, brick, timber, or a combination of these materials. An example is shown in Fig. 7. In addition, a number of firms now manufacture such houses either in timber or metal and these can be purchased in sections and erected on the farm. Fig. 8 illustrates an example of one such house erected at St. John's College Farm at Long Wittenham, Berks. In planning a fattening house, the essential points to be observed are that it should be dry, comfortable, well lighted and well ventilated, but free from draughts. It should be arranged to give maximum convenience in feeding, and for cleaning with the minimum of labour. Such a building will help to ensure against trouble from many of the common diseases and, therefore, produce healthier and more thrifty pigs. The work of attending to the pigs can be carried out with greater ease, speed and comfort, and this means increased interest and efficiency on the part of the pigman, again leading to better results. Moreover, a man will be able to look after a larger number of pigs.

The usual lay-out of a fattening house consists of two rows of pens, with a dunging passage to each row and a central feeding passage. A continuous trough, running along the front of each row of pens, has much to recommend it. After the size of the pen itself, the amount of trough space determines the number of pigs that can be accommodated per pen. Twelve to fourteen inches of trough space per pig is a usual allowance, the larger figure being desirable for a full-grown baconer. The pen proper should be just sufficiently large to hold comfortably the required number of pigs, frequently ten; if the pen is too large the pigs may not regularly use the dung passage, so that the pens become dirty and require more cleaning. In a large house it is a good plan to have a few pens of about half the normal size in which to accommodate the inevitable small lots that are left when finished animals are drafted for slaughter. It is generally inadvisable to mix pigs at this age, as the strangers generally fight, and it is an obvious waste of space to allow a few pigs to occupy a full-sized pen. Dung passages, although sometimes made smaller, should, in the writer's opinion, be at least 3 feet 6 inches in width, to allow pigs at bacon weight to turn round in comfort.

No attempt will be made to describe in detail the construction of such a building, but there are a few points of importance to which it may be desirable to draw attention. A building with a double row of pens should, where possible, run north to south with the long walls facing east and west. Then, if windows and roof lighting have been installed, one row of pens will get sunlight in the morning and the other in the afternoon. Light is all important and, as a pig house need not be high at the eaves, roof lighting is more important than windows in the side walls, although such windows are very useful for ventilation and, if omitted, must be replaced by ventilator blocks. Thorough and efficient ventilation of a fattening house, particularly a large building, is a first essential for successful fattening. Without it results are bound to be unsatisfactory. Fresh air may be introduced by windows fitted with side hoppers set in the walls, or by inlets in the side walls set 12 inches or so above ground level; such openings, however, should be fitted with baffle plates and should not be placed opposite the openings from the dung passages into the pens, otherwise direct draughts will be produced. A more elaborate system is used in some houses by the insertion of tubes or boxes in the side wall, the air entering low on the external face of the wall and reaching the interior well above the level of the pigs; this method is, however, appreciably more costly. Hot air rises, and the vitiated air should be removed at the ridge by cowls or louvres. The front of the pens may be finished with piping, which method allows of a freer circulation of air in the pens, especially when, in very hot weather, the doors at each end of the central passage are left open during part of the day.

The partition walls between the pens should preferably be of concrete or brick, although wood is also used. All walls with which the pigs come in contact should be cement faced to a height of 3 feet, so as to facilitate thorough cleaning. Many farmers object to wood partitions because of the difficulty of either cleaning or disinfecting them and because they are so often gnawed by the pigs.

The construction of the floor is another point of major importance. It is essential that it should be dry and warm. Concrete is the material most commonly used, but it is imperative that this should be laid on a good bed of broken stone or brick, clinker, rubble or some similar material to ensure that contact of the concrete with the underlying soil is completely broken. If this has been done there is no reason why a concrete floor should not prove satisfactory. The contact of a concrete layer with the soil may also be broken by the use of hollow brick, or by laying a damp-course of bitumen. Other flooring materials such as cork-brick and rubber are available, but they are much more expensive and, although their insulating properties are high, further information is necessary as to their durability. All floors should be laid with an even fall, with arrangements for carrying the urine from each pen to an outside channel. A very high roof is undesirable, as this renders more difficult the maintenance of the desired temperature.

In one fattening house which was recently inspected the dung passages were not roofed over, and the pigs had access to them through a square opening cut in the pen wall. The owner stated that the pigs used the dung passages regularly, even in the coldest winter weather, and that their live-weight gains were as good as similar pigs in another house which had the dung passages inside. He also stated that the pigs appeared generally healthier and that there was an almost entire absence of the coughing which is so common in many large fattening houses of the usual types.

Cost.—The erection of a modern fattening house calls for capital expenditure and the cost varies with the type of house erected and the material used in construction. Price and Ling (Ref. 5), in a most interesting and informative report on an investigation conducted in the South-West of England, in dealing with Danish-type fattening houses, state that "For the sixteen houses specially constructed the cost, per pig housed, varied from £1 to £6, the common figure being about £2." They point out that the low figure of £1 was for an all-wood building put up by a local contractor to house 200 pigs. The present writer has seen only one large house in which the erection costs were as low as £1 per pig. This was also an all-wood building with a number of points open to legitimate criticism, and the owner, in building another house, decided that it was advisable to spend more and do things better.

The writer (Ref. 4), some three years ago, erected a fattening house to hold 200 pigs, the capital cost of which worked out at about £4 per pig. The house (Fig. 9) was, however, built of concrete and "Aerocrete" blocks, was well fitted out and should have a long life. Many examples of individual costs could be given, but it would appear from the figures available that satisfactory houses can be erected at a capital cost of from £2 to £4 per pig. The material used in construction, varying from all-concrete to all-wood and the type of fittings, etc., used, must obviously produce a wide variation in capital cost. Variation in the internal dimensions will also produce a variation in cost, and it may be emphasized that the measurements of pens, passages, height, etc., should be just sufficient and no more; waste space only increases the overheads which the pigs must carry.

The cost of the fattening house may be regarded from another point of view, which probably gives a truer picture. If, for example, a house with a capacity of 200 pigs is taken and (to avoid any possibility of over-estimating) the annual output of bacon pigs is taken at only 400, then the following calculations can be made. If the house has been constructed of lasting materials, a life of forty years may be assumed. If the capital cost of one house is taken at £3 per pig (£600) and of another at £4 per pig (£800) and if 7½ per cent. is allowed for interest and repayment of capital, then the cost of housing, per bacon pig sold, works out at 2*s.* 3*d.* and 3*s.*, respectively. Again, supposing that the houses have not been constructed to last so long, that the assumed life is twenty years and that 10 per cent. is allowed for interest and repayment of capital, then, allowing the same capacity and annual output but putting the capital cost at £2 per pig (£400) and £3 per pig (£600), the cost of housing, per bacon pig produced, will be 2*s.* and 3*s.*, respectively. Thus, instead of thinking of the capital cost as one large figure it can be translated to a figure of between 2*s.* and 3*s.* to be carried as an item in the cost of production of each pig. As an offset to this figure there is the undoubted saving in time and labour which such a house gives and, in addition, the general improvement in efficiency which most farmers with houses of this type claim that they obtain.

The points mentioned in connection with farrowing houses—about convenience in feeding and attention—apply with equal force in a modern well-planned fattening house. With a good store attached to the building and water laid on at convenient points, the feeding of the pigs can be carried out quickly and easily. Dung passages reduce the area to be cleaned and therefore the time occupied in the work. It is not an exaggeration to say that, given such a building and conveniences, a man can, with no more work, look after twice the number of animals that he could attend in small scattered and inconvenient buildings. Where pigs are being fattened in reasonably large numbers there seems little doubt that the cost of a special building can be easily recovered by savings in other directions and by improved results.

In the account of his methods of production, Lord Lymington (Ref. 1) says, with reference to fattening houses, " but, speaking from personal experience, the writer has found that these houses shorten the fattening period, over other methods, by a good month to six weeks. This alone makes more than enough saving to pay interest, and, on the capital cost, to provide for early redemption of the capital. Their capital cost is just over £3 per pig."

Fattening houses with outside yards.—As an alternative to houses where the pigs are kept entirely indoors, some producers prefer to erect houses with outside concrete yards attached to the pens. Where this is done the pens are frequently larger, with a capacity of twenty or more pigs per pen up to bacon weight. This is a relatively simple type of building to erect, while it may happen that there is an existing building on the farm which can be adapted and have a row of yards added. Ample trough space should be provided in the outside yards and the pigs should use the covered portion only for sleeping. The points put forward for this method are fresh air, direct sunlight and more room for exercise; on the other hand, there is not the same economy of labour in feeding and general attendance. One large producer who favours this type of house claims for it the further advantage that he can make up for dispatch a large lorry- or wagon-load of pigs from the same pen, and so avoid any fighting and consequent marking of the pigs before they reach the factory.

ROBERT RAE.

The University,
Reading.

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CHANGES IN BEEF IMPORTS BEFORE AND AFTER THE OTTAWA AGREEMENT.

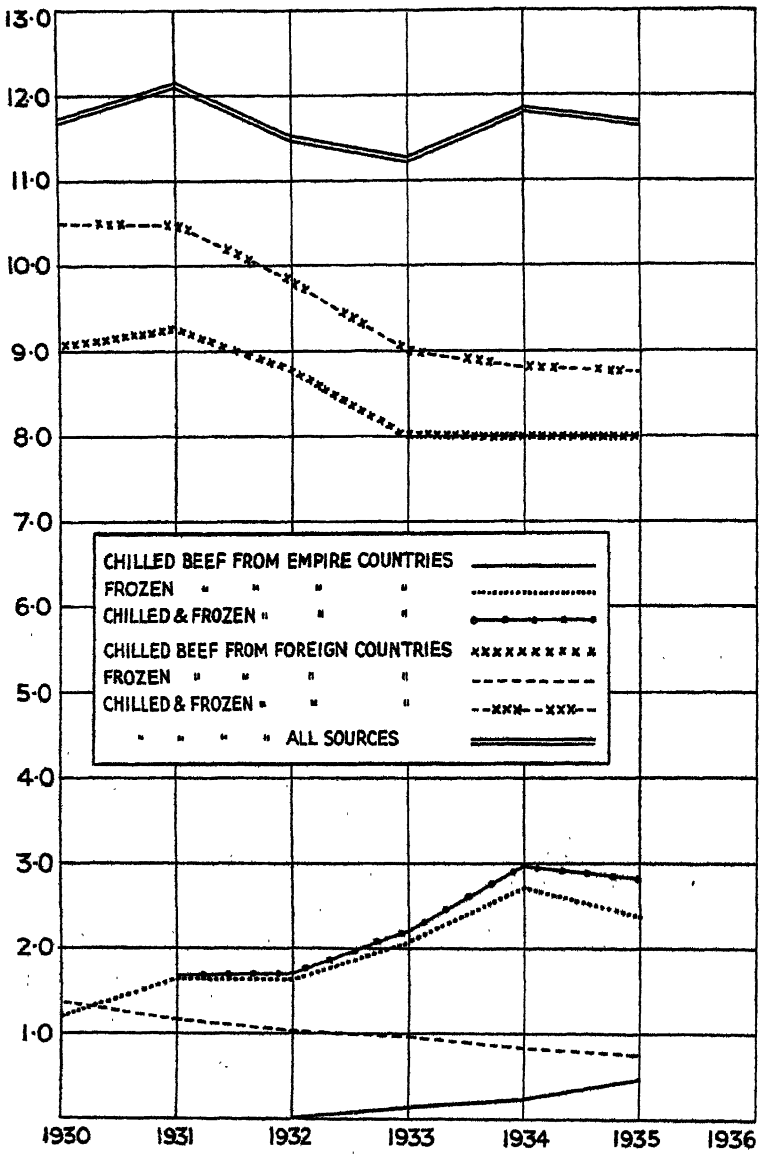
AN examination of the diagram on the following page will show broadly the effect of the Ottawa Programme embodied in the Ottawa Agreements Act of 1932, in which the principle of quantitative regulation was applied to foreign supplies of certain classes of meat, and in connection with which Australia and New Zealand agreed to limit their shipments of that commodity to the United Kingdom. The standard year, on which the scheme of regulation was based, was the year ended June 30th, 1932, which is generally known as the "Ottawa Standard Year."

The Ottawa Programme provided for the limitation of imports of foreign chilled beef to the same level as in the standard year, but it was later arranged, by agreement with the exporting countries, that this quantity might be reduced by as much as 10 per cent. As regards frozen beef, the programme provided for a gradual reduction in foreign supplies. The figures show that the Ottawa Programme is being closely carried out.

Supplies from Empire countries have been the subject of voluntary agreements, the earliest of which were entered into in the autumn of 1932, following closely on the heels of the Ottawa Conference. It was necessary to regulate supplies of beef from all sources, as the price of home-produced beef in this country was threatened with collapse, and in November, 1932, the chief suppliers of frozen beef, Australia and New Zealand, agreed to regulate their shipments until 1st January, 1933, when regulation under the Ottawa Agreement became operative. The intention of these arrangements was to secure for the home producer the first place in his own market and, secondly, to give the Dominions a reasonably expanding share of imports into the United Kingdom.

CHILLED BEEF: FOREIGN AND DOMINION.

At the beginning of the period under review, chilled beef came entirely from Argentina, though, in the later part of



it, supplies came in small but increasing quantities from Australia, New Zealand and South Africa. The terms of the agreement with Argentina, after Ottawa, are worth recording as illustrating the difficulty of reconciling the conflicting interests of trade reciprocity with that country, the Dominions' need to find a market for their beef, and the requirements of our own home beef producers. These terms were firstly that imports of chilled beef from Argentina would not be reduced below the quantity imported in the corresponding quarter of the Ottawa year unless, after consultation with the Argentine Government, it was thought that such action was necessary in order to secure a remunerative level of prices in the United Kingdom market; and further, that no such restriction would be maintained if it appeared that the imports so excluded were being replaced by increased imports into the United Kingdom of other kinds of meat (other than experimental shipments of chilled meat from other parts of the British Commonwealth of Nations) with the result of neutralizing the desired effect on prices. If, owing to unforeseen circumstances, His Majesty's Government considered it necessary that imports from Argentina of chilled beef should be reduced in any year by an amount more than 10 per cent. below the quantity imported during the Ottawa year, it would be provided that imports from all the Dominions should be reduced by the percentage over and above 10 per cent., by which imports from Argentina were reduced. As a matter of fact, it was found to be necessary in 1933 to reduce all foreign supplies by 10 per cent. of the Ottawa year quantities in order to preserve a remunerative level of prices in this country.

At the end of that year, 1933, it was found that the position of foreign chilled beef was as follows:

	Cwt.
Ottawa year importation	8,845,368
Arranged reduction	840,621
Maximum permitted imports (allowing for tolerances)	8,016,747
Actual imports	8,029,247

In the same year, experimental shipments of chilled beef from Australia and New Zealand began and chilled beef imports from Empire countries amounted, over the year, to 142,000 cwt., of which the experimental shipments from the two countries amounted to 4,020 cwt. only. Technical developments have since made possible a considerable expansion in this trade, and chilled beef shipments from Empire countries increased to 238,000 cwt. in 1934, 478,000 cwt. in 1935, and 247,000 cwt. in the first half of 1936.

Foreign supplies since 1933 have continued to be regulated on the same principle as in 1933.

FROZEN BEEF AND GENERAL.

As will be seen from the diagram, frozen beef is sent mainly from Empire countries, more especially from Australia. The total importation of the Ottawa standard year was 2,554,000 cwt., of which Australia sent 1,134,000 cwt., New Zealand, 475,000 cwt., and all foreign countries together 920,000 cwt. The increases which the diagram shows in years subsequent to Ottawa were, in some part, arranged at the Conference. There, the Australian Government agreed to do its best to see that shipments in 1933 would not exceed 110 per cent. of those in the Ottawa year, whilst New Zealand estimated that their shipments for the *season* 1932–33 would not exceed approximately 110 per cent. of their figure in the Ottawa year. Events proved that Australia sent 78,000 cwt. less than the agreed quantity, whilst New Zealand in the *whole year* 1933 sent considerably more than the quantity which they agreed for the *season*, 1932–33. The figures were 823,000 cwt. against 658,000 in the previous *calendar* year, or 475,000 cwt. in the Ottawa year (July 1st, 1931 to June 30th, 1932), the figures showing a much greater increase than 10 per cent.

In 1934, imports from Empire countries totalled 2,732,000 cwt., of which Australia was responsible for 1,599,000 cwt. and New Zealand 1,023,000, the remainder consisting of very small consignments from South Africa, Canada and Southern Rhodesia. Canada was the chief of these minor sources, supplying in the last quarter of the year 52,000 cwt. The corresponding total for 1935 was 2,402,000 cwt., of which 1,468,000 cwt. was supplied by Australia and 806,000 cwt. by New Zealand.

For the first half of 1936 an arrangement was made with the principal supplying countries, Empire and Foreign, by which total imports of beef were limited to the quantities imported in the corresponding period of 1935, and provision was made for a limited increase in shipments of chilled at the expense of frozen beef. Actual imports from all sources were almost exactly the same as in January—June, 1935, a decline of rather less than 2 per cent. in Empire supplies balancing an increase of less than 1 per cent. in imports from foreign sources.

Notwithstanding the efforts made in regard to limitation of imports, however, the live stock position in this country, which was all along reckoned to be a serious one, became worse in the summer of 1934 and the situation led to the passing of the Cattle Industry (Emergency Provisions) Act of that year. This Act provided for payments from the "Cattle Fund" of a subsidy at a rate not exceeding 5*s*. per live cwt. (9*s*. 4*d*. per cwt. dead weight) to producers of certain classes of fat cattle sold for slaughter in the United Kingdom. Eight hundred and one live-weight centres and thirty-six dead-weight centres were authorized for the certification of cattle for subsidy, and payments averaging about three-and-three-quarter million pounds per annum have been made in respect of some one-and-a-half million animals per annum. A later Act passed in July of this year (1936) provides for the continuance of the subsidy until July 31st, 1937, if it proves to be necessary to continue it beyond its existing term, before the Government's long term policy can be brought into being.

The Minister of Agriculture outlined the Government's long term policy in a statement made by him in the House of Commons on July 6th, 1936. Briefly, it is that there should be maintained in this country a regulated market with full supplies for the consumer consistent with a reasonable level of remuneration for the producer. To assist this regulation, there should be set up an Empire Meat Council and an International Meat Conference, the first representative of the United Kingdom and other Empire countries, and the second of the United Kingdom and other Empire countries, together with foreign countries which have sent substantial quantities of meat to the home market. It would be proposed, unless otherwise agreed by the Conference, that aggregate exports of beef during the next three years should not exceed recent levels. Subject to this provision, it is intended that the producers represented on the two bodies should assume complete responsibility for the regulation of imports of beef, and that the Governments of the participating countries should undertake to apply the recommendations of the Conference which, in order to have binding force, would have to be unanimous. The Minister said that whilst, at that time, he could not forecast the terms of any settlement that might be reached with the Argentine Government, he was prepared to undertake later in the year to invite Parliament to pass legislation providing for the collection of customs duties on imports of chilled, frozen and other descriptions of beef and veal from foreign countries. The Government considered that, if adequate provision were to be secured in one form or another for the needs of the United Kingdom cattle industry, the aggregate financial assistance now given to it would have to be increased until such time as the conditions prevailing in the industry improved. The Government proposed, therefore, also to seek the authority of Parliament to apply to the assistance of the industry such sums not exceeding £5,000,000 per annum as might from time to time be needed. As an offset to this liability, the Exchequer would benefit to the extent of the revenue from the import duties already mentioned. Furthermore, Parliament would be asked to give the Government general power to *regulate* imports of live stock and meat, the power to be held in reserve, should the need arise to use it.

R. S. LANGFORD.

Ministry of Agriculture and Fisheries,
10, Whitehall Place, S.W.

THE SOCIETY'S GOLD MEDAL, 1936.

SIR WILLIAM CECIL DAMPIER, Sc.D., F.R.S.

SIR WILLIAM DAMPIER has earned a position of distinction in many walks of life—in science, in economics, in agriculture, and in administration.

Besides his original scientific papers, which have won him the Fellowship of the Royal Society, he has published a " History of Science," a work on " Politics and the Land," and " Studies in Nature and Country Life."

Sir William Dampier has rendered notable services to agriculture. He was appointed Secretary to the Agricultural Research Council when that body was formed in 1931, and he continued to serve in this capacity till 1935. The success of the Council in directing and co-ordinating agricultural research has been largely due to his unfailing devotion to the work. He has been a member of the Council of the Royal Agricultural Society of England since 1921, and in 1935 became Chairman of its Journal and Education Committee. The Society gratefully acknowledges his many services.

His Majesty conferred the honour of Knighthood in 1931, in recognition of Sir William's services to agriculture and economic science.

REPORT OF THE RESEARCH COMMITTEE.

THE Society's Research Committee has, during the past year, considered many applications for assistance, and has again been able to provide funds for a considerable number of approved research projects.

I.—WORK COMPLETED.

The staff of the Rothamsted Experimental Station has completed the examination of the records of the Woburn experiments and the results have been published in a book entitled " Fifty Years of Field Experiments at the Woburn Experimental Farm." Some of the more important lessons from the experiments are discussed by Sir John Russell in his review on " Soils and Manures," in the *Farmer's Guide* (see pp. 349 to 365).

II.—WORK IN PROGRESS.

ROTHAMSTED EXPERIMENTAL STATION.

A.—FARM ELECTRIFICATION—THRESHING EXPERIMENTS.

The comparison of the electric motor with the farm tractor, as sources of power for barn machinery, was continued in 1935–36. This year's trials were restricted to threshing.

A General Electric Company "Witton" portable motor of 20 h.p. was compared with a new International Harvester Company 10–20 tractor, and with an old tractor of the same make, for driving a thresher with a 48-inch drum. The cost of electric power to the Rothamsted farm was reduced from one penny to a halfpenny per unit during the year of the trials. The standing charges of the Electricity Company were equivalent to a further 0·34*d.* per unit consumed, so that the total cost of electricity was 0·84*d.* per unit; the costs are calculated below both at this rate and at one of 0·5*d.* per unit.

With one crop—oats—the output of the thresher was lower with the motor than with the tractor drive; this, however, was due to unfavourable conditions (a low proportion of grain to straw in the crop, and pitching from a low stack) when the trial with the motor was being carried out.

The average cost of electricity, at ·84*d.* per unit, was 6·9*d.* per hour, and at ·5*d.* per unit, 4·1*d.* per hour, compared with a fuel cost, for both the tractors, of 11·7*d.* per hour. This latter cost was slightly higher than it need have been, because in two of the tests the fuel mixture used was unnecessarily rich. For lining up the tractor and thresher the cost was of the order of 3½*d.*, against a figure of 4½*d.* for the motor.

The costs per hour's threshing, under the actual conditions at Rothamsted, and including overhead charges, were :—

Electrical equipment (at ·84*d.* per unit)	19·6*d.*
do. do. (at ·5*d.* per unit)	16·8*d.*
New Tractor	23·5*d.*
Old Tractor	15.2*d.*

In spite of the reduction in the electricity tariff the old tractor thus remained the cheapest source of power. Its economy was due to its low capital value (and consequent small depreciation charge) and its low maintenance cost during the year in question.

When allowance is made for the differences that might be expected to obtain as between conditions at Rothamsted and those on an ordinary commercial farm, and for the amount of use that might be expected to be made of the installations in ordinary practice, the average costs become :—

Electrical equipment (at ·84*d.* per unit)	11·7*d.*	per hour.
do. do. (at ·5d. per unit)	8·9*d.*	,,
Tractor	21·1*d.*	,,

The figures indicate that the price of electric power might rise, over a period of years, to 2*d.* per unit (inclusive of standing charges), without making electricity more expensive than tractor power. This figure of 2*d.* per unit is slightly higher than that arrived at on the basis of the tests of the preceding year, which was 1·85*d.* The difference is accounted for by the somewhat higher fuel consumption of the tractors in the 1935–6 tests.

B.—BACTERIOLOGY DEPARTMENT.

SUMMARY OF RECENT AND CURRENT WORK ON NODULE BACTERIA OF LEGUMES.

The work of the department during the year has been concerned with the study of strains of nodule bacteria from the roots of clover.

Certain strains which, though producing nodules, yet fail to benefit the plant, have been found both in America and in this country. It seems that the weak growth of clover in certain districts is due to the presence of these non-beneficial strains of bacteria. The latter are not merely useless to the clover plant but are indirectly harmful since they prevent the formation of nodules by most of the beneficial strains. The causes of this competition between strains of nodule bacteria are of considerable practical interest since their elucidation may enable us to maintain the population of beneficial nodule bacteria in the soil. It is at present uncertain whether the competition between strains exists in the soil surrounding the roots or in the roots of the plant itself. Experiments are now in progress which should settle this point. It has, however, been found at Rothamsted that dominance in competition between strains of the bacteria is not necessarily associated with their effectiveness or lack of it, although unfortunately the non-beneficial strains are *usually* able to prevent nodule formation by good strains. Nevertheless two beneficial strains have now been discovered which are not only able to infect plants growing in soil infested with a non-beneficial strain, but which can actually prevent the latter from forming nodules. The use of such strains for inoculating clover seed should prove beneficial in districts where the soil is infested with non-beneficial strains.

This work will soon require to be extended (*a*) by making a survey of the distribution of non-beneficial clover bacteria over the country, and (*b*) by making inoculation trials with beneficial and dominant strains in those districts where non-beneficial strains have been found.

The formation and growth of clover nodules produced by good and poor strains of bacteria are also being studied with the hope of discovering why the latter should be non-beneficial. A large amount of material has been collected, but until this has been examined microscopically it is premature to report on this work.

C.—ROTHAMSTED FARM.

THE FEEDING OF CATTLE ON PASTURE.

An experiment has been planned to procure evidence on the value of the manurial residues of cake, etc., consumed by stock on pasture. An area of 60 acres of poor grassland, which has recently been acquired at Rothamsted, has been allocated for the purpose.

The area will be divided into six pairs of paddocks, each paddock being five acres in size. On one of each pair, during the cake-feeding year, the grazing stock will receive a ration of concentrates, while the corresponding plot will be grazed by stock which will receive no concentrates. In the second year of the rotation both paddocks will be laid up for hay, the aftermaths being grazed. In the third year both will be grazed without cake feeding. The effects of the manurial residues from the cake feeding will be measured partly by the yields of hay and partly by the live-weight gains of the grazing animals.

The 1937 grazing season will be devoted to a uniformity trial, and cake feeding will commence in 1938.

RESEARCH INSTITUTE IN ANIMAL PATHOLOGY, ROYAL VETERINARY COLLEGE, LONDON.

Diseases in Young Calves.

Although diseases prevalent among young calves have attracted a good deal of attention on the Continent and in America, no extensive observations have yet been made in this country. The Research Committee, therefore, decided to assist in carrying out a systematic investigation, with the object of obtaining more precise information on the causes of death in young calves, and of formulating more rational methods of control.

It was considered that the most useful means of approaching the problem would be to make an exhaustive examination of a series of calves dying within the first few weeks of life. After this, the causes of disease could be studied in greater detail. The first part of this project has been completed and the results have been published (Lovell, R., and Hughes, D. L., 1935, *Journal of Comparative Pathology and Therapeutics*, Volume 48, page 267). Arrangements were made with veterinary surgeons and stock owners in different parts of the country to forward to the Institute 100 calves as soon after death as possible. It is important to observe that the examination included only those calves which had been dead a short time; this entailed promptitude on the part of owners and veterinary surgeons, and the Committee is grateful for the help extended in this essential requirement. In the laboratory, bacteriological cultures were prepared from many different fluids and tissues of each animal, the bacteria isolated were identified, and their significance considered in the light of existing knowledge and the sites from which they were isolated. Briefly, the results obtained were as follows:—

(1) *White scour* or "*colibacillosis*" accounted for the death

of 37, and probably for six more, of the 100 examined. This disease appears during the first week or fortnight of life, and is caused mainly by *Bact. coli.* This organism is present in the intestines of healthy animals, and does not produce disease under normal conditions, but in the case of calves (and presumably other young stock) it may assume a disease-producing rôle. For example, there may be excessive multiplication of *Bact. coli* in the intestines of the calf because of some digestive disturbance, or because the calf has been deprived of an adequate amount of colostrum. When this occurs, the bacteria are liable to invade the tissues of the body, and even the blood stream, and to cause disease and death. The extent of this invasion is no doubt determined in part by the resisting powers of the individual calf, but it is probably determined also by the presence of special strains or races of *Bact. coli* in the particular herd or area. One of the objects of the work at present in hand is to determine whether such specially powerful races of *Bact. coli* actually exist and, if so, to devise tests by which they may be recognized.

(2) *Respiratory disease*, viz., pneumonia, accounted for the death of 24 of the 100 calves examined. The actual type of pneumonia and the underlying causes varied. Twelve cases were caused by a bacterium known as *C. pyogenes*, well recognized to be responsible for "summer mastitis" and other suppurative disorders in cattle, sheep and pigs. Six further cases were caused by a bacterium to which the investigators prefer to give no specific name at the moment. In America a similar organism has received the name "*B. bovisepticus* Group 1"; and this for convenience is referred to as a "haemolytic cocco-bacillus." It has been isolated, frequently in pure culture, from the lungs of calves which have died from a broncho-pneumonia, several of which calves were weakly when born, or were born prematurely. In older and stronger calves the organism apparently causes a mild bronchitis, or merely some respiratory catarrh. Of the remaining respiratory cases, one was due to a member of the *Pasteurella* group, organisms which cause diseases in a variety of animals. The other five were mixed infections, *i.e.*, were apparently due to invasion by more than one type of bacterium. The bacteria isolated from these mixed infections were *C. pyogenes*, the "haemolytic cocco-bacillus," *Staphylococcus aureus*, and *Pasteurella.*

(3) A member of the *Salmonella* group of bacteria was isolated from two calves, both of which were one month old. This group of bacteria is of importance both to medical and veterinary science, since it includes ones which cause diseases in poultry, sheep, horses and other domestic animals, whilst some species produce disorders in man.

(4) In the remaining 31 cases examined, the ætiology was

obscure or considered not to be due to bacteria. Two, and probably three, of these calves died from poisoning, whilst another died from peritonitis owing to rupture of the fourth stomach.

This preliminary survey will undoubtedly form a useful basis for future work, as it indicates the presence in this country of certain diseases of calves due to particular types of bacteria, and, furthermore, gives a slight indication of their frequency. The work in hand at present includes a more intensive study of the bacteria isolated, especially those strains of *Bact. coli* which are associated with cases of "white scour."

UNIVERSITY OF DURHAM

(*Armstrong College, Newcastle-on-Tyne*).

The Eradication of the Common Sheep Tick.

Work has been continued during the year and is fully reported in an article contributed by Mr. W. Lyle Stewart, M.R.C.V.S., and appearing in the earlier part of this *Journal* (see p. 85).

NORFOLK AGRICULTURAL STATION.

An Investigation into the Cumulative Effects, on a Light Arable Soil, of Various Methods in the Disposal of Beet Tops and Straw.

During the past year experiments have been laid down at the Norfolk Agricultural Station to determine the relative values of various methods of straw disposal.

On the one hand winter manure production by horned stock has been unprofitable, due to the low prices of some animal products. On the other hand the development of power farming (in which straw disposal by stock is difficult) has made it desirable to introduce alternative means of supplying the humus necessary to maintain the condition of the land. The problem is of interest to all arable farmers, for, at some time or other, the cheapest method of straw disposal becomes an important and sometimes vital problem in farming. Thus a number of new practices have arisen, and it is the purpose of the present series of experiments to determine the ultimate effects, on the state of the land, of these practices.

The series of experiments at Sprowston consists of four distinct but related trials, three of which have already been started, while the fourth will be put down during the coming winter (1936–7). When all four trials are running, each crop in a four-course rotation (of sugar beet, barley, seeds, wheat) will be represented in the series.

The methods of straw disposal are being studied in conjunction with the methods of beet top disposal, and the 12 treatments in the trials are as follows :—

A. Tops carted off.
B. Tops ploughed in.
C. Tops "sheeped."

Each of the treatments A, B and C is combined with each of the following four treatments :—

(*a*) No straw or farmyard manure.
(*b*) Farmyard manure for beet and wheat.
(*c*) Straw ploughed in for beet, and spread on young seeds.
(*d*) Straw ploughed in after beet, and spread on young seeds.

Each application of straw is accompanied by a dressing of a given amount of sulphate of ammonia. The nitrogenous manure is not ploughed in with the straw, but is put on the seed-bed of the crop to be taken after the straw has been applied —the assumption being made that there will be sufficient nitrogen in the soil to bring about the decomposition of the straw, and that the sulphate of ammonia will replace the nitrogen that is used up in this process.

These treatments are arranged in six randomized blocks for each trial.

Each trial, therefore, must be carried through a full rotation before all the treatments have been applied. After the harvesting of each crop, however, information is obtained on the effect of some of the treatments. For instance, two trials have already been harvested, viz., barley (after sugar beet) and a hay crop. The barley yields supplied information on the methods of disposal of the beet tops, with and without straw, and the hay yields on the effect of spreading straw on the young seeds. The sugar-beet trial, which will be harvested during the winter of 1936–7, will give information on the relative values of farmyard manure and straw for sugar beet. The results so far obtained are for one year's trial only, and are therefore of little value until they have been confirmed ; it is, however, interesting to note that the increases in the barley yields, due to the manurial value of the sugar-beet tops, are similar to those which were obtained in previous trials carried out at the Norfolk Agricultural Station and reported in detail in the 1935 issue of this *Journal.* The effect on the hay yield of spreading straw on the young seeds was negligible, but where straw was ploughed in after sugar beet, and a seed-bed application of sulphate of ammonia given to the barley crop, the yield of both grain and straw was increased.

UNIVERSITY COLLEGE OF WALES, ABERYSTWYTH.

TRIALS OF GRASS SEEDS MIXTURES.

Seeds of Welsh Plant Breeding Station pedigree strains were sown in 1935 to produce a harvest of seeds in 1936. The trials themselves will be sown in 1937. The intention is to sow at least 100 acres in trials at a number of carefully selected centres in English counties.

The weather conditions during 1936 were most unfavourable for seed production and yields were in some cases far below expectation. The total quantity of seed in the hands of the Welsh Plant Breeding Station will, however, probably be sufficient to allow the trials to proceed in 1937. Should the quantities prove to be not quite sufficient, the deficiency can be made good by purchase from reliable growers who have obtained stock seed from the Station and whose seed-production areas have been under the general supervision of the Station.

Arrangements for the laying down of the trials are well advanced. Most of the trials next year (1937) will be put down in counties not too remote from Wales. The Agricultural Organizers for Somerset, Wiltshire, Gloucestershire, Herefordshire, Worcestershire, Shropshire, Cheshire, Lancashire and Middlesex have all agreed to collaborate.

It has been decided to compound a separate seeds mixture for each of the trial areas. Mr. M. T. Thomas, of the Welsh Plant Breeding Station, is arranging to visit each of the experimenting counties and will discuss with the Organizers concerned the selection of suitable centres and the composition of each of the mixtures to be sown.

The mixtures will all be prepared at Aberystwyth and despatched, ready for sowing, to the several centres. It is hoped that, in most cases, the experimenters will be willing to sow control areas with seed of ordinary commercial strains without cost to the Society.

UNIVERSITY FARM, CAMBRIDGE.

The Rationing of Bacon Pigs.

The trials are designed to produce information on the question of the relative economy of full feeding *versus* restricted rationing of bacon pigs. An interim report of the first series of trials was published as an annex to last year's Report of the Committee. Since then a second series, with ten pairs of pigs, has been completed. A third and probably final group of twenty pairs was under experiment at the time of preparing this report, and the experiment was expected to end in December, 1936. It is hoped to publish a full report on all three series, and covering the whole one hundred individually fed pigs, in the next issue of the *Journal.*

THE FARMER'S GUIDE TO AGRICULTURAL RESEARCH IN 1935.

For the past eleven years the Royal Agricultural Society of England has issued annual summaries of Agricultural Research, as carried on in its leading branches, prepared under the direction of the Research Committee of the Society. The publication, originally issued under the title of *Agricultural Research*, is now known as *The Farmer's Guide to Agricultural Research*, for this describes the main purpose with which the Society undertook the work, namely, to spread the lessons of research among those to whom they are likely to be of greatest use by giving the farmer information on the results of the year's work of the experimental stations in a summarized and simple form.

The survey of scientific work which it provides is not limited to research conducted in the British Isles, but includes references to the results achieved in any part of the world from which light may be thrown on the problems of British agriculture.

As last year, *The Farmer's Guide* forms a section of the Society's *Journal* so that it may be in the hands of every member of the Society. At the same time a number of copies are being bound separately for distribution to the Press and to centres of Agricultural Education and Research.

The Authors responsible for the various sections are the same as those who contributed to the issue of the previous year.

A few copies of previous issues (for the years 1925-1934) are still available.

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I.—GRASSLAND.

THIS account of grassland research may be regarded as a continuation of the section on grassland included in the article on "Crops and Plant Breeding" published in the last issue of the *Guide*. The greater part of that section was devoted to breeding work and to the significance of strains in herbage plants, but some account was also given of the behaviour of species and strains under grazing management. In the present review, species and strain behaviour is discussed further, while methods are also described by which the botanical composition of the herbage may be controlled or altered. The control of the botanical composition of grass swards is of great importance to the standard of grassland productivity, and recent research shows that the farmer can exercise a greater control than was hitherto thought possible, although there are, of course, natural limits due to soil and climatic conditions.

(*a*) SPECIES AND STRAINS.

Experiments conducted by Milton in Wales support the view that strains of perennial ryegrass, cocksfoot, timothy, meadow fescue and fine-leaved fescue show significant differences, within the species, with regard to soil establishment and growth of seedlings (Ref. 1). The commercial strain of timothy gave a better establishment than the indigenous strain, but with fine-leaved fescue the contrary was true. No differences were found between the strains of the other species. In all cases the early growth of the commercial strain was more vigorous, but the indigenous strains, which probably suffered from delayed germination and latency of the seedlings, tended to make good their disadvantage by the following spring. Although the power of establishment of the strains appeared to be characteristic, whether they were sown in pure plots or in mixtures, competition between the constituents of the mixtures affected their establishment. Milton's observations support the view (as far as perennial ryegrass, timothy and fine-leaved fescue are concerned) that species with large seeds have a higher plant establishment than those with small seeds.

The importance of strains in herbage plants, and the behaviour of different species under pasture conditions have been demonstrated in field trials carried out by Thomas in various parts of Wales (Ref. 2). Thomas considers that his results can be usefully applied to large areas of grazing land in Great Britain. Indigenous perennial ryegrass and wild white clover showed that they were the most important species for permanent pasture mixtures, while rough-stalked meadow grass, crested dogstail and red fescue were most useful for combating weeds. The use of these three weed-combating species depends, of course, on soil conditions, crested dogstail being suitable for thin, dry soils, and red fescue for low-fertility conditions. The true value of pedigree cocksfoot is realized only on poor upland soils, where it is to be preferred to perennial ryegrass, whether for grazing or for hay. Thomas suggests that alsike clover, trefoil and meadow fescue are unsuitable for permanent pasture mixtures on most Welsh soils, because they do not thrive under the studied conditions; while timothy is worth including only as a heavy seeding of a suitable indigenous or pedigree strain.

The behaviour of commercial Ayrshire and indigenous Kentish perennial ryegrass, when grown as pot cultures on different soil types and with different lime dressings, is described by Nisbet (Ref. 4). Stated briefly, his results confirm the opinion that ryegrass is unsuited to acid soils, but he found that the two strains behaved characteristically and responded differently to lime dressings when grown on acid sandy and acid peaty soils. In the early stages of growth the Ayrshire strain appeared to be more affected by acidity and lime than the Kentish strain, but both were affected characteristically, in the early and later stages of growth, by liming on the two soil types. The Ayrshire strain responded more markedly to liming (by increasing the number of tillers) on the sandy soil; but on the peaty soil the Kentish strain was more responsive to liming, increasing its growth by developing larger leaves. This work, besides demonstrating differential strain behaviour, emphasizes the importance of liming acid soils in order to secure proper establishment and growth of grass seedlings. Further work on these lines is described by Nilsson-Leissner (Ref. 5), in which the behaviour of various strains of grasses in response to manurial treatment was investigated. He showed that strains of timothy, smooth-stalked meadow grass and red fescue each utilized nitrogen in an individual and characteristic manner whether grown in pure stands or in mixtures.

Trials with red clover in Scotland emphasize the importance of strains and species from another point of view. It is suggested that the question of earliness and lateness is of primary importance, because the later strains suffer from competition with the grasses. The most successful Late-Flowering strains were found to be the Essex and the Suffolk, while English and New Zealand strains were the best of the Broad Red type (Ref 3).

The nutritive value and chemical composition of grassland herbage cannot be discussed here, but a brief reference may be made to the influence of botanical composition on these two important characters. Several years ago Williams and Evans (Ref. 6) demonstrated that strains of white clover differed in their crude-protein and lime contents, and Fagan and Watkins (Ref. 7) drew attention to the importance of the "miscellaneous herb" element in contributing important minerals to the herbage of poor mineral-deficient pastures. These two authors also pointed out that at certain seasons of the year plants such as daisy, ribgrass and cat's ear are eaten in preference to *Agrostis* on pastures where the latter grass is predominant.

More recent work on this subject continues to emphasize the important effect of botanical composition on chemical composition, and it has been shown that the latter is affected less by manurial treatment than by the plants constituting the herbage (Ref. 8). The richness in mineral elements of certain non-gramineous plants is of great importance, and Kauter (Ref. 9) and Daniel (Ref. 10) both draw attention to the high phosphorus, potassium, magnesium and lime contents of leguminous plants generally, and of some weeds. Shafter (Ref. 11), working in Australia, found that certain weed species such as *Erodium*, chicory and plantain were very high in protein and low in fibre. Generally speaking, grasses are lower in ash and protein than leguminous plants, but there is evidence that grass species differ in their ash and dry-matter contents. This is borne out by Archibald and Bennett (Ref. 12), who found that cocksfoot is higher in ash than timothy, smooth-stalked meadow grass and sheep's fescue. Milton (Ref. 13) has also demonstrated that grass species vary in their dry-matter contents, but could find no consistent differences between strains. Dry-matter content varies, of course, with the system of management, as this affects the quickness of growth and the stage of maturity of the species. Palatable species like timothy, which are grazed hard, will have a low dry-matter content, while neglected species will increase in dry matter as they mature. High dry-matter content does not necessarily mean high nutritive value, because it may be due to a high fibre content. The importance of high dry matter and high mineral content must be considered in terms of palatability, because the two former characteristics are useless if the species possessing them are, owing to their unpalatability, neglected by the animal.

(*b*) GRAZING AND BOTANICAL COMPOSITION.

Grazing experiments in Wales conducted by I. Jones lead him to conclude that herbage plants can be classified into two groups according to their behaviour under grazing (Refs. 14 and 15). Species like cocksfoot and tall fescue (and various weeds) thrive best in the absence of the grazing animal, while there are two types of species which are favoured by the grazing animal—those favoured by light grazing, *e.g.* Yorkshire fog, and those favoured by heavy grazing, *e.g.* *Agrostis* and white clover. In these experiments Jones also found that the yield and composition of the weed element were affected by the use of the mowing machine. Continual mowing increased the number of plants of species like buttercup, plantain and dandelion, but the yield from these plots was only half that from the unmown plots where yarrow, ox-eye daisy and meadow vetchling were able to grow large. In another investigation on wet soil Jones noticed that flying bent (*Molinia*) and rush throve in the absence of grazing and mowing, and were reduced more or less in proportion to the hardness of grazing or the severity of cutting. On these wet-soil pastures the weed flora was very sensitive to grazing and mowing, while all the grass species except sweet vernal grass and fine-leaved fescues made their best growth under conditions of medium or hard grazing, which produced a sward of small-tillered grasses. The experiment suggests that wet and marshy soils are very sensitive, as far as the botanical composition is concerned, to the system of grazing and mowing.

The importance of controlled grazing in the prevention of weed infestation of young swards is reported by Martin Jones (Ref. 16). He was able, by grazing according to the amount of growth available, to keep a sward practically free from creeping thistle, and to prevent bent (*Agrostis*) and Yorkshire fog from increasing. Uniform stocking throughout the year, however, resulted in an increase of these three species. Similar experiments on a poor old pasture demonstrated that here also controlled grazing was effective in reducing the proportion of undesirable plants. It is significant that nitrogenous manuring had practically no effect in altering the trends in the botanical composition caused by grazing in the young pasture. The importance of grazing in the establishment and maintenance of a satisfactory grass-clover ratio is emphasized by Findlay (Ref. 17), who advocates sufficiently hard grazing in the second season to enable white clover to establish itself satisfactorily, and recommends that subsequent grazing should not be too hard, because of the suppressing effect of white clover. Findlay also discusses the use, for the maintenance of a good grass-clover ratio, of different strains of grasses which make their maximum growth at different times of the year. He found that Danish cocksfoot and Ayrshire perennial ryegrass were suitable for early spring growth, while a New Zealand cocksfoot and Kentish perennial ryegrass were, if the conditions were good, suitable for summer, autumn and winter grazing.

The behaviour of some pasture species under grazing conditions in Australia is described by McTaggart in Ref. 18. While the behaviour of the different strains need not be mentioned here, there is one point of interest in connection with the use of lucerne and white clover in grazing mixtures. Lucerne proved a great success because it was able to withstand drought and heavy grazing, and gave body and balance to all mixtures. New Zealand earliest certified white clover, on the other hand, was almost a complete failure, because it could not withstand the drought with the severer grazing and mowing treatments. This use of lucerne in grazing mixtures for harsh treatment under dry conditions is of great interest, and suggests that greater use might be made of this plant for pasture purposes.

In conclusion, a brief mention should be made of a paper by Bates on the flora of footpaths and gateways (Ref. 48). He maintains that the chief factor governing the botanical composition of footpaths in grassland is the mechanical effect of treading and puddling the soil. Plants which possess leaf and stem structures and life forms which are unharmed by the puddling can survive this treatment. This explains why smooth-stalked meadow grass, perennial ryegrass and broad-leaved plantain are generally very much in evidence on grass footpaths. White clover is generally found at the edges of footpaths where the treading is less severe, but this species is controlled more by its demand for light than by its tolerance of treading. Around field gateways the limiting factor to plant growth is the churning of the soil in winter, so that the area must be repopulated each year by seedlings of annuals and perennials. These observations demonstrate differences in the ability of plant species to withstand mechanical interference, and have a practical significance in relation to species colonization, survival and encouragement in grassland management.

(*c*) MANURES AND BOTANICAL COMPOSITION.

Fertilizers and manures can, within certain limits, alter the botanical composition of a grass sward. Species of herbage plants are differentially stimulated or inhibited in their growth by different forms of fertilizer treatment, but the effect of any such treatment is complicated by inter-specific competition and by the relative proportions of the species before the fertilizer was added. Moreoever, soil and weather conditions influence fertilizer action, so that it is impossible to forecast the exact result of adding a particular fertilizer in a given case. But the undoubted occurrence of specific likes and dislikes, and the fact that there are "high-fertility" grasses, such as cocksfoot and ryegrass, which respond to liberal feeding, and "low-fertility" grasses such as bent and Yorkshire fog which do not, enables certain generalizations to be made. Nitrogenous manures, particularly if the nitrogen is always in the same form, tend to reduce the number of species, and to encourage the grasses at the expense of the clovers, while cocksfoot and perennial ryegrass appear to be particularly stimulated by inorganic nitrogen, rough-stalked meadow grass by nitrates, and smooth-stalked meadow grass by ammonium salts.

Investigations by Blackman (Ref. 19) have shown that the same amount of nitrogen, in different fertilizers, may produce quite different effects on the botanical composition of a sward and on the weed flora in particular. Sulphate of ammonia was the only fertilizer to reduce the weeds significantly, and Blackman explains its action on the hypothesis that the ammonia absorbed by the plant is poisonous if it accumulates but that, when it combines with reserve carbohydrates as it does in the grasses, its toxicity is removed. This hypothesis would also explain the reduction in the amount of white clover, which is a common result of adding sulphate of ammonia to grassland, white clover having, compared with the grasses, a low carbohydrate reserve. Blackman's work suggested that the same general trends occurred, regardless of the kind of nitrogenous fertilizer, in the grass representation.

Davies has found that the botanical composition of some grass swards in Wales can be affected from seeding time by the use of basic slag and nitro-chalk, both of which depress the clover establishment but have little effect on the grasses (Ref. 20). Appreciable changes in the botanical composition of North Wales pastures are also reported by Roberts and Thomas as the result of their nine years' observations (Ref. 21). Their general conclusions are that perennial ryegrass requires an ample supply of nitrogen; that crested dogstail is indifferent to fertility; and that the complete omission of phosphates suppresses wild white clover and increases weeds. The evidence also suggested that cocksfoot, rough-stalked meadow grass and wild white clover decreased, while perennial ryegrass held its position as the dominant grass, and timothy increased, with applications of basic slag. The omission of potash led to an enormous increase in the perennial ryegrass and an almost complete suppression of wild white clover.

The importance of the botanical composition of the sward and of soil temperature, as affecting the efficiency of nitrogen dressings in producing early spring growth, is emphasized by Page (Ref. 22). He has found that the most responsive swards are those containing perennial ryegrass, foxtail and cocksfoot; while either clovery or poor, bent-dominant swards are useless for producing "early bite." Page also maintains that nitrogenous fertilizers need not reduce the clover in a sward provided correct grazing is practised, the reason being that clover suppression is usually due to shading by the grasses. Radtke (Ref. 23) also draws attention to this shading effect of grasses, and states that organic nitrogenous manures (farmyard manure and liquid manure) can increase the amount of white clover in a pasture by stimulating bacterial action, which action is liable to be inhibited by inorganic fertilizers. Weller (Ref. 24) supports the view that well-rotted farmyard manure or liquid manure, combined with regular grazing, helps to establish clover. Stapledon (Ref. 25) has described the beneficial effects of grazing, of farmyard manure and of lime on the spread of white clover. He also maintains that it is remunerative to produce protein without clover, and by the excessive application of nitrogen, only when the pasture is a good fertile one; on the poorer types of pasture phosphatic dressings should be used to encourage white clover. Work by Dodd in America supports this view by showing that nitrogen is less effective in increasing the yield of a clovery than of a grassy pasture (Ref. 26).

Hudson, Doak and McPherson (Ref. 27), working in New Zealand, conclude that nitrogen should be used in that country only to produce out-of-season grass on pastures which have a high percentage of early grasses, particularly because an increase of both grasses and clovers can be produced by the use of superphosphate alone. They explain the reduction of white clover after dressings of sulphate of ammonia as due to a residual toxic effect of the fertilizer on the nitrogen organisms in the soil; symptoms of nitrogen starvation may become evident after the immediate effects of the dressing have passed.

The influence of soil type as affecting the action of manures on grassland has been described from various parts of the world. In Australia, phosphatic dressings have been found to be effective in stimulating the growth of grasses, whereas under certain conditions sulphate of ammonia has reduced both grasses and clovers, although it proved to be beneficial on heavy clay soils where ryegrass was plentiful and clover absent (Ref. 29). In New Jersey, U.S.A., sulphate of ammonia and nitrate of soda were without any effect on a gravelly loam, but increased the ratio of grasses to weeds, and discouraged the clovers, on the Collington loam soil. On the other hand, superphosphate was of little use on the Collington loam, but strikingly increased the white clover, and the cover generally, on the gravelly loam (Ref. 30). In Britain also the effectiveness of fertilizer applications has been shown to be influenced by soil and locality. On acid soils it may be quite impossible, because of the lack of leguminous plants, to obtain a response to fertilizers without nitrogen (Ref. 32). Again, mineral phosphates are often ineffective in the eastern counties, whereas in the western parts of the country they give good results (Ref. 31). Findlay's investigations with temporary pastures in Scotland support the evidence already mentioned concerning the ineffectiveness of nitrogen fertilizers for obtaining early spring growth on clovery swards. Findlay also reports a temporary stimulation of the clovers by nitrogenous dressings, provided the soil contains sufficient phosphorus, potash and lime (Ref. 17).

An account of a fertilizer experiment in Pennsylvania, U.S.A., refers to the reduction of bent and timothy by lime; by lime and phosphorus; by lime, phosphorus and potash; and by lime, phosphorus, potash and nitrogen in combination (Ref. 28). Nitrogen by itself reduced the clovers, and lime by itself caused an increase in the bare patches and in the area covered by weeds. Čepikova (Ref. 33) has found, however, that fertilizers are not equally effective in increasing the growth of timothy and red clover at different stages of growth. Timothy appeared to be stimulated by nitrogen and phosphorus to the greatest extent at the tillering stage, while red clover was most sensitive in the rosette stage. Later nitrogenous dressings reduced the yield, and Čepikova concludes that nitrogen is essential to plant growth only in the early stages. Potash appeared to have the greatest effect on timothy when the plants were at the tillering stage, while red clover was affected equally at all stages.

Brenchley (Ref 35) has summarized the result of fifteen years' observations on the effect of season and manurial treatment on the composition of grass swards at Rothamsted. On unmanured plots, and in the absence of nitrogen, seasonal fluctuations were large, but the addition of complete mineral fertilizers and nitrogen reduced the seasonal effect to very small proportions and maintained a high proportion of grasses. There was strong evidence to suggest that characteristic seasonal fluctuations were induced by the various fertilizers and manures, but the addition of minerals caused the grasses and clovers to vary in correlation, while the miscellaneous herbs remained more constant than on unmanured and unlimed plots. In this report many details are given of the behaviour of individual species, but only the more important results can be quoted here. Lime reduced sweet vernal grass, Yorkshire fog and *Agrostis*, and the behaviour of foxtail appeared to be very closely associated with the acidity of the soil because lime, mineral fertilizers, sulphate of ammonia and minerals, and heavy feeding, all encourage it; on the other hand it decreased in amount under acid conditions, with applications of nitrate of soda and where there was a general deficiency of nutrients. Cocksfoot behaved somewhat similarly, being increased by sulphate of ammonia and lime with minerals. Yorkshire fog tended to dominate on acid soil to which sulphate of ammonia and minerals had been added, while tall oat grass would grow well only with good manuring and a sufficiency of lime.

(*d*) IMPROVEMENT OF POOR PASTURES.

Poor pastures may be improved either by altering the botanical composition of the herbage or by improving the nutritive value of the existing herbage. There is a large acreage of grassland in this country which is poor because of neglect and starvation, and considerable improvement could often be effected by drainage, cultivation, liming and manuring. Bond (Ref. 36) maintains that the presence of excess moisture and of a matted surface growth are the causes of the poor state of most pastures. Stapledon (Ref. 31) also thinks that free movement of soil water is very important for the maintenance of good grassland; he advocates the substitution of permanent grassland by leys of from four to ten years' duration, because, in the majority of cases, these are more productive than old grass. Long leys are scarcely practicable on open hill country, but there are many acres of poor lowland pasture which would be improved by ploughing up and re-seeding. Oldershaw (Ref. 37) has shown the great difficulty of making a tumble-down pasture equal to a well seeded ley, even after thirty years of careful management.

The procedure to be adopted in improving grassland, and the extent of the possible improvement, will depend on the initial botanical composition, the contour of the land, the physical and chemical nature of the soil, and the climate. *Molinia* pasture, for example, can be greatly improved by fencing and by installing drinking facilities for the stock, followed by the burning or mowing of the roughage, fertilizing with lime, phosphate and nitro-chalk, and hard grazing. This procedure should result, in four or five years, in the production of an *Agrostis* pasture, which can be ploughed or roughed up and sown with a mixture of leafy perennial ryegrass, white clover and crested dogstail. *Agrostis* pasture, on the other hand, may not require such prolonged treatment, but can often be improved by applying a complete fertilizer, ploughing up, and then re-seeding. Stapledon, who advocates the above procedures, attaches great importance to the use of lime, which he thinks is best applied on the ploughed land before seeding. This may result in an increase in the perennial ryegrass and white clover, thereby making the pasture more palatable and winter-green. A great deal of Stapledon's work is concerned with hill pastures, which have become accessible for improvement only with the advent of the caterpillar tractor and some of the newer cultivators. But great improvements can be made by the use of the mowing machine alone, which should be an important implement in the hands of the grazier.

The simplest mixtures, consisting of a leafy strain of perennial ryegrass and wild white clover, can be used successfully for the improvement of poor pastures, but Stapledon considers that the addition of rough-stalked meadow grass and/or crested dogstail usually gives better results. The success of a renovating mixture depends on the choice of leafy, indigenous and pedigree strains of the most suitable species, and it may be advisable on stronger soils to replace perennial ryegrass by cocksfoot, while crested dogstail should be an important constituent on the thinner soils at higher elevations. In addition, it may be possible to rectify any mineral deficiency of the herbage by including "mineral-efficient" herbs such as ribgrass, hawkweed, cat's ear and daisy. Experiments are now being conducted to investigate the possibilities of such a practice, but it should always be remembered that the simplest method of improving a poor pasture, by altering its botanical composition, is to introduce a leguminous plant. Generally, this can be accomplished only by applications of lime and phosphates, accompanied perhaps by inoculation with the nodule organism (Ref. 38). When the pasture is very weedy it may be necessary to put the land through a short rotation, followed by a short-term ley, before the long ley is attempted (Ref. 39). A preliminary report on the application of these general methods, as advocated by Stapledon, is given in Ref. 40.

The reclamation of moorland by drainage, manuring and drastic mechanical treatment is being conducted in Scotland (Ref. 41) and in Ireland (Ref. 42). Heddle (Ref. 43) and Heddle and Walker (Ref. 44) have also undertaken a thorough investigation of hill grazing improvement in Scotland and, in the course of a survey of the grazings of S.E. Scotland, have found that the best types are the good grassy pastures containing some heather, draw moss (*Eriophorum vaginatum*) and deer grass (*Scirpus caespitosus*). The grazing value of heather, draw moss and deer grass depends very much on their growth habit and age, and controlled burning is most important in keeping them young and nutritious. Apart from burning, great improvements have been secured on *Nardus-Molinia* pastures by the encouragement of *Agrostis* and Yorkshire fog through the use of the disc harrow. Phosphatic dressings and renovating mixtures, consisting of commercial seed cleanings (perennial ryegrass, Yorkshire fog, wild white clover and crested dogstail), have also been used successfully.

Two accounts of the value of controlled burning in pasture improvement, in North and South America respectively, are given in Refs. 45 and 46. Vincent maintains that "burning with discretion" is one of the few economical methods of improving the botanical composition and quality of natural grazings in parts of South America. In Nebraska, U.S.A., Weaver has found that spring burning is of little use in the control of weeds, while autumn burning increases the number of plants in the sward, but reduces the yield even more considerably than does spring grazing. Burning in rotation can be of distinct value on certain types of grazing, and may be indispensable to the maintenance of other types in good condition, but it is obviously a weapon which must be handled with care. It possesses certain points in common with other drastic means of reducing excess coarse growth, inasmuch as the indirect effect of laying bare the ground has to be considered in addition to the direct effect on the individual species. This entails re-awakened competition between one species and another, which is of vital importance to the establishment and maintenance of a mixed sward.

II.—WEED CONTROL.

(a) Chemical Means.

A good deal of research is being directed towards the discovery of the most efficient chemicals for the eradication of pernicious weeds on agricultural land. Broadly speaking, there are two ways of combating weeds with chemicals, viz., by the use of toxic sprays and by the use of fertilizers. Toxic sprays may be used either in standing crops or on bare soil, and the choice of spray must depend on the presence or absence of a crop. Where there is no vegetation other than the weeds, chlorates and arsenic compounds may be used; while in standing crops copper sulphate, ferrous sulphate and sulphuric acid are the chemicals most commonly employed. Sulphate of ammonia and kainit are familiar examples of chemical fertilizers which may also be used as weed-killers, and calcium cyanamide is peculiar in that, while it can behave toxically when first added, subsequent decomposition liberates nitrogen which has a stimulating effect on the crop.

The action of fertilizers on grassland weeds has been previously referred to in discussing the effect of manures on the botanical composition of grass swards, and this account will be confined mainly to weed control on arable land. On acid soils, infested with spurrey and sheep's sorrel, applications of lime may considerably reduce these weeds, while kainit, applied at the rate of five to six hundredweight per acre, has been found very beneficial on potash-deficient soils (Wells, Ref. 49). Sulphate of ammonia, either as a dust or as a spray, has been widely used for reducing weeds like corn buttercup and spotted medick on arable land. Engledow and Woodman (Ref. 52) also report the successful use of sulphate of ammonia in the eradication of knot-grass (*Polygonum aviculare*) and soft knotted clover (*Trifolium striatum*) in grass. They found that the efficiency of the spray was vastly increased by the use of soft soap as a "wetter," *i.e.*, for ensuring satisfactory adherence of the spray to the leaves of the weeds. It is suggested that the incorporation of suitable wetters in the manufacture of weed sprays would prove a distinct advantage.

On the Continent, calcium cyanamide has been used successfully for spraying charlock, poppy and wild radish on arable land, and yellow rattle (*Rhinanthus crista-galli*), and daisies on pastures. Applications were made at the rate of one to one-and-a-half hundredweight per acre in the late autumn or early spring (Ref. 49). The wide use of calcium cyanamide is also discussed by Long and MacDowall (Ref. 50), who report its successful use against cornflower, charlock, and various weeds in asparagus beds. The same authors refer to the eradication of plantains, daisies and cat's ear (*Hypochaeris radicata*) in grassland by application of ammonium thiocyanate. In grassland the chemical destroys the weeds and at first scorches the grass, but the latter soon recovers with the aid of the nitrogen which is liberated from the rapidly decomposing thiocyanate. Aston, Bruce and Thompson (Ref. 51) have found that ammonium thiocyanate can also be used successfully against ragwort (*Senecio jacobea*) in pastures. They advise trying to kill about eighty per cent. of the ragwort plants with the first application, and later treating the remaining plants individually. In all cases the grass, although it was at first burnt, recovered well, and stock appeared to prefer it to untreated rougher pasturage. There seems to be evidence that in addition to killing the foliage, ammonium thiocyanate, if washed into the soil, can kill underground parts.

Before discussing the important recent work on the use of toxic sprays which have no fertilizing action, a brief reference must be made to sulphuric acid. This chemical is probably used more extensively than any other toxic spray, and appears to be replacing copper sulphate. Its advantages are that it is quicker in action, less dependent on weather conditions, and yet does not permanently injure cereal crops. Besides its use for spraying weeds in cereals, it is now being used in bulb fields and in potato crops, where it serves to kill off the haulm as well as the weeds. This killing of the haulm towards the end of the season ensures easier lifting, reduces the incidence of late blight, and causes the tubers to ripen off more rapidly (Ref. 50).

The most potent weed killers are, however, the chlorates and various arsenic compounds, whose application is generally restricted to areas where no cultivated plants are growing. Long and MacDowall refer to the use of sodium chlorate for killing most weeds on paths and vacant soil patches. Applications of one-and-a-half to two hundredweight per acre have been found sufficient to kill such weeds as couch, *Agrostis*, dock and crowfoot on arable land which is to be free from crops for four to six months. As a spray, the concentration varies from a one per cent. solution for ragwort, bracken and nettles to ten per cent. for the deepest-rooted perennials (Tincker, Ref. 50). Under many conditions it seems that chlorates and arsenic compounds can be used with equally good results, but Lynes, in his experiments in Colorado, U.S.A. (Ref. 53), found that acid arsenical compounds were cheaper and did not leave any residual effect. Lynes also maintains that chlorates, whether applied as a spray to the foliage or as a soil dressing, are equally effective in eradicating field convolvulus. Fuerst (Ref. 54) also found that sodium chlorate and arsenic were equally effective in eradicating docks and sorrels in grassland when the chemicals were applied to the subterranean parts after the top growth had been cut down.

The killing of perennial weeds with strongly growing subterranean parts is the most difficult of weed eradication problems. Such a weed is the hoary cress or chalk weed (*Lepidium draba*), which is common in parts of England and is reported as a serious menace in New Zealand, Australia and parts of U.S.A. Morgan (Ref. 55) describes how, in Australia, long cultivations are necessary to eradicate this weed and draws attention to the inadequacy of spraying unless the chemical can be made to penetrate to the subterranean parts. This penetration to the perennating part of the plant can take place, under certain conditions, when the foliage is sprayed; but it depends on the rapid killing and penetration of the leaf tissues as far as the water-conducting cells which pass into the stem and root. If weeds are growing under conditions which ensure a water deficit in the plant, and if the soil is sufficiently dry to prevent this deficit being made up, then the toxic spray will be drawn down into the subterranean parts of the plant, and will kill them. In other words, this type of perennial plant has to be approaching a state of permanent wilting before the spraying of the top growth will be effective in killing it. This fact limits the application of the method to areas where summers are sufficiently dry, and it is probably very rare for such conditions to occur in this country.

Crafts (Ref. 56) has studied carefully the action of chlorates on plant tissues and has confirmed Morgan's opinion that sulphuric acid acts as an efficient aid to the penetration of this spray. Craft's work has also shown that chlorate has unique properties as a plant poison, acting slowly on the plant and gradually accumulating until it reaches a toxic concentration. The plant is affected in a characteristic manner, the subterranean starch reserves being depleted and the general vitality of the plant lowered. Arsenical compounds, on the other hand, are protoplasmic poisons, which kill both young and old tissues as they penetrate. Although, in general, these investigations show that chlorates are never more effective than acid arsenicals, it is suggested that the use of chlorates and sulphuric acid may be more satisfactory for spraying pastures, because of the reduced risk of poisoning and of dangerous residual effects. Rain during the summer removes by leaching the residual effect of chlorate, but where the top soil dries out their effect may persist for three years.

In considering the easier and surer way of killing plants by direct root absorption from the soil, Crafts draws attention to the variability of the toxic action of chlorates; on different soil types the killing power may vary as much as five times. Although the stage of growth does not appear to affect the efficiency of chlorate treatment, it does seem that the most rapid absorption of chlorates occurs when the roots are absorbing water and mineral elements in largest quantities. Crafts emphasizes the great importance of climate in determining the most efficient method of killing weeds by chlorate poisoning (Ref. 57), and maintains that, in regions of summer rainfall, soil applications are essential to kill perennial plants. The resistance of different species of plants to the action of chlorates depends on the starch storage, root permeability and pattern, and general habit of growth; in all cases, however, it was found more effective to poison the plants simultaneously through both the leaves and the roots rather than by either method separately.

The position with regard to the relative merits of sodium arsenite and sodium chlorate appears to be as follows. The arsenite is as toxic as the chlorate, and is less subject both to decomposition in the soil and to leaching. On the other hand it is liable to be held in the surface layers of the soil, and may not penetrate deeply. Arsenite is therefore better suited to spraying the top growth with the object of obtaining penetration of subterranean parts; whereas the chlorate is superior for direct soil applications, because it is more easily washed down into the soil where it may remain unaffected for many months.

(b) BIOLOGICAL MEANS.

Within the last ten years, particularly in countries where serious weed pests have been recently introduced, serious attempts have been made to control weeds by means of plant eating insects. Examples of such weeds are the prickly pears (*Opuntia* spp.) in Australia, and ragwort in New Zealand. In Ref. 58 Cameron gives an account of the New Zealand Weed Control Scheme, and discusses biological methods of weed control with particular reference to ragwort. There may be great danger in introducing insects into a country for the purpose of weed control because, if the weed is nearly related to some crop of economic importance, the insect may migrate to the crop and destroy it as well as the weed. This occurred in the attempt against the blackberry, where the controlling insect attacked raspberries also, and insect control had to be abandoned. The migration of an insect from a wild plant to a cultivated one is also particularly evident in the case of the Colorado beetle, which fed originally on a wild plant (*Solanum rostratum*) growing in the Rocky Mountains of America and has since migrated to the potato plant. A certain degree of protection against migration may be ensured by utilizing insects which possess a limited host range and a specialized mode of life. The problem is considerably simplified when the weed has no near relations among the cultivated plants.

Cameron has discovered that an Arctiid moth (*Tyria jacobea*, L. (*cinnaba*)), which feeds on the leaves, and a seed-fly (*Pegohylemia seneciella*, Meade), which eats the young seed, cause extensive damage to ragwort, and could be used for its control in New Zealand. Their effectiveness is considerably reduced, however, by the ability of the plant to produce a secondary crop of flowers after the initial attack. Further, proper control can be attained only if conditions which pre-dispose an area to grass denudation are first removed, the weed being unable to withstand grass competition. In Great Britain poor light land and derelict over-grazed pastures tend to suffer most from ragwort infestation. On good land efficient management controls the weed, but on the poorer land bad management may so encourage the weed that insect control becomes impossible. This question of the prevention of weed invasion or spread by suitable management, which removes all pre-disposing causes, is the widest application of biological weed control. In grassland, particularly, the importance of management is, in this respect, of great importance.

In conclusion it may be emphasized that weeds can only survive in so far as their life history, habit of growth and methods of reproduction, are suited to the peculiar conditions of cultivated or agricultural land. Bates has recently given two examples of this, one of which was referred to above (Ref. 48). The other example is seen from a survey of the lucerne leys of the Eastern Counties in which it was found that in the second year of the ley five of the most commonly occurring weeds were biennials (Ref. 59). These weeds were white campion (*Lychnis alba*); wild mignonette (*Reseda lutea*); wild carrot (*Daucus carota*); viper's buglos (*Echium vulgare*) and musk thistle (*Carduus nutans*). These species are able to survive because the lucerne is comparatively undisturbed for two years, during which time biennials are able to complete their life cycle without interference. In the third year the biennials tend to be suppressed by perennials such as docks (*Rumex* spp.); perennial thistles (*Cirsium* spp.); bent (*Agrostis* spp.); and couch (*Agropyrum repens*); but the biennials can persist if the lucerne is a thin plant.

THE ARTIFICIAL CONTROL OF PLANT DEVELOPMENT.

The study of plant development in relation to the environment is one of the newer branches of physiological research which has a direct practical importance. Every cultivator of plants must be familiar with the rhythm of development and growth which is characteristic of each species of plant, and which is particularly obvious in the case of cereals. An illuminating example may be seen in winter wheat, when the life of the plant can be easily traced as it passes from the seedling stage to tillering, from tillering to lengthening of the culms, and then from flowering through the various phases of ripening. It is obvious, even to the most casual observer, that all these phases of growth are affected differentially by the growing conditions. Unfavourable conditions during specially susceptible phases may result in a serious reduction of the final yield. A an example of this, the incidence of hot drying winds during flowering may be noted as seriously affecting the number of grains set in the ears. Plants are peculiarly the sport of prevailing weather conditions, and their subsequent development may be entirely controlled by conditions experienced during an earlier phase of growth.

Much attention is therefore being given to the possibilities of reducing, by artificial treatment, the dependence of plant development on the environment, thus ensuring a certain degree of control by the grower. In the 1933 issue of this publication reference was made to the effect of light and temperature on plant development, and a description was given of pretreatment methods of stimulating the growth of various crops (Ref. 60). Since 1933 a great deal of work has been done on the subject, which is usually referred to as *Vernalization.* Evidence from all parts of the world has been collected and described in Ref. 61. Much of the work is as yet only of academic interest, but some of the more important practical aspects are worth considering.

It has now become well established that it is possible, by appropriate treatment of seeds, grain or tubers, not only to stimulate earlier flowering and maturation in plants but that such treatment may change and stimulate the whole growth of the plant. Wheat provides at present the classical example of the effect of pre-treatment of the grain on the subsequent growth of the plant. If winter-wheat seed is exposed to the necessary low temperatures after a preliminary soaking in water it may be sown in the spring and will behave like a spring variety. Every variety of wheat requires special treatment, and dissimilar results are obtained from the same treatment with different varieties and under varying conditions. In Russia the vernalization of wheat is practised on a large scale, 1,250,000 acres of vernalized seed having been sown in the U.S.S.R. in 1934. This has been necessary because of the unsuitability of large areas of land to the wheat varieties at present available. Better results are obtained from vernalized seed of suitable varieties than from the indifferent stocks in general use in the areas in question. Vernalization has either enabled the wheat to be spring sown instead of winter sown, or else the resulting earlier maturation has enabled the crop to escape unfavourable conditions. In addition it has been found possible, by use of suitable vernalized varieties, to cultivate wheat within the Arctic Circle.

But the usefulness of these obvious effects of vernalization is strictly limited; where autumn sowing of suitable winter varieties is the normal procedure, there is apparently no advantage in spring-sown vernalized crops unless other benefits are derived. Winter-sown, unvernalized wheat is usually superior in tiller number, weight of plants, and total weight of grain, to the same variety vernalized and sown in the spring. This circumstance, of course, makes it unlikely that the treatment will be used in countries where autumn-sown wheat can be regularly and successfully grown. On the other hand, Schultze claims that he has obtained an increased yield from spring wheat when it was vernalized, and Varpolomeeva and Murajev both report beneficial effects on such characters as thousand-grain weight, baking quality, yield of flour and type of loaf (Ref. 61).

The stimulation of the plant to early growth by vernalization may indeed have definite advantages in certain wheat-growing areas. Fokeer and Vyrov have shown that a better root and leaf development, and an increased dry-matter accumulation, may result from vernalization. Again, there are certain areas in Russia where it is desirable to reduce the plants' tendency to prolonged vegetative growth, and it has been possible to hasten the early development without adversely affecting the final yield. Popova stresses this aspect of the work, and states that the general stimulation to growth enabled spring wheats and winter barleys to escape droughty periods and thereby to give increased yields both of grain and straw. Dix's work in Germany, with vernalized spring-sown winter rye, also demonstrated great increases in the yield of straw and grain from vernalization, but even so the yield was only half that from a normal autumn sowing.

Most of the work quoted above is Russian, and up till the present only in the U.S.S.R. have important practical applications of vernalization been developed. In France, Italy, Holland, the U.S.A. and other countries it is at present thought that there is very little practical use for the vernalization of cereals, except perhaps, in isolated cases, for the re-sowing or substitution of winter by spring sowings. Bell (Ref. 62) has conducted small scale experiments on the vernalization of some wheat, barley and oat varieties, in order to test its possibilities in this country. The investigations showed clearly that the stimulation of juvenile growth and hastening of the time of ear emergence was very marked in some varieties, and also depended on the time of sowing. If spring sowings of certain winter-wheat and winter-barley varieties are made in early March, the increased earliness due to vernalization amounts only to a few days; but when the sowing is made at the end of March or the beginning of April, there may be three weeks difference in the date of earing between the vernalized and unvernalized plants. This does suggest a possible application for late spring sowings, particularly since, in these experiments, the unvernalized plants succeeded in sending up only a few ears scattered over a comparatively long period of time, and would have yielded little. Any use for vernalized winter varieties will depend on their yield and quality of grain compared with those of vernalized and unvernalized spring varieties. The question is being investigated at Cambridge, but the results of experiments so far conducted suggest that, although earlier tillering may be induced, the number of ears at harvest may be reduced. Lamberton and Parkinson (Ref. 65) have also reported a reduction of tillering due to vernalization of cereals in this country. It seems probable that, because of our equable climate and our usually successful cultivation of autumn-sown varieties, very little practical use can be made of the vernalization of cereals in this country. There appears to be much greater scope in the cultivation of market-garden and forage crops, and in plant breeding (Ref. 63).

Investigations in Russia suggest promising lines of research in the vernalization of herbage and forage crops. Travin reports marked effects on the vegetative growth of red clover, lucerne, sainfoin, cocksfoot and timothy. Both he and Čepikova have found that considerable increases in the yields of grasses and clovers may be obtained by chilling the seed, which increases amounted, in the case of cocksfoot and timothy, to as much as fifty per cent. In some of these perennial plants low temperatures appeared to be responsible for accelerated development, increased vegetative growth and a higher seed yield. Double-cut red clover, for instance, grew more quickly, was taller, possessed a greater number of stems and flower heads, and gave a greater yield. Čepikova also maintains that in some species, *e.g.*, meadow foxtail, the effect of vernalization was apparent in the second year's growth. In Canada also, Wort found that chilling the seed of sweet clover resulted in an increase in the dry weight of the resulting green fodder (Ref. 61).

It therefore appears that low-temperature pre-treatment can stimulate vegetative growth, accelerate flowering, increase the yield of vegetative and reproductive produce and affect the quality. This considerably widens the scope for the practical application of the process, and it is interesting to see that Rudorf and Stelzner, in Germany, have succeeded in increasing the fresh weight and marketable value of several varieties of lettuce by pre-chilling the seed.

Although low temperature treatment has become of such practical interest and importance, it must be realized that light is of equal importance in controlling certain phases of plant development. The length of exposure to daylight and the temperature interact on different phases of development and determine the amount and the form of the growth made by plants. It has been shown repeatedly that these two factors are of prime importance in the development of winter wheat, and an interesting example is seen in the growth of vernalized southern winter-wheat varieties in the continuous summer daylight of the northernmost parts of Russia. Extremely luxuriant growth is obtained in this way, the continuous light being most suitable for development after the grain has passed through controlled exposure to cold. Experiments conducted in this country by Purvis (Ref. 64) have shown that in cereals long days and low temperatures shorten the time from sowing to earing and flowering, and reduce the rate of tillering. In Australia, Forster and Vasey (Ref. 66) have investigated the effect of length of day and temperature on the development of some spring and winter wheat varieties. Germination and ripening were affected by temperature only, but the duration of the tillering and shooting stages were dependent on both the temperature and the length of day. The greatest number of tillers was produced under conditions of long daylight and low temperatures. An interesting investigation by Harrington and Horner at Saskatoon, Canada, demonstrated the effect of length of day and of temperature on the yield and straw length of some wheat varieties (Ref. 67). The authors emphasize the importance of varietal behaviour when wheat is sown at different times of the year, and urge that yield trials should be conducted on sowings made at different dates. Every variety requires certain definite light, temperature and moisture conditions for its most successful development, and varietal adaptation may be explained very largely in terms of these three factors.

To conclude this account of the effect of light and temperature on plant development, the work of Evans, Allard and McConkey with strains of timothy must be mentioned (Ref. 68). Thirteen strains of timothy, varying in their times of flowering, were sown at two localities in the U.S.A. and at one in Canada, the three differing considerably in latitude and altitude. The earliest strains flowered twenty-four days earlier at the southernmost station than at the most northerly one, while the latest strains were sixteen days earlier at the most northerly station. The results are explained by assuming that the earliest strains were able, at the southern station, to make use of the suitable growing conditions in the early spring, while the low temperature in the north prevented early growth. In the case of the later strains, however, the length of day, in the south, was too short for early development, and the inflorescences were produced sooner in the longer days of the more northern latitude. This investigation demonstrates an important physiological difference between strains of the same species, which difference determines their earliness or lateness of growth and therefore influences their agricultural use under different environmental conditions.

IV.—WHEAT INVESTIGATIONS.

(*a*) Grain Composition, Texture and Quality.

Baking quality, or "strength," is really only one aspect of the question of quality in wheat, and a certain amount of care is necessary in the use of terms when discussing the grain characters which determine the economic use of wheat. In its most general usage the term quality should denote the suitability of the product for the particular purpose for which it is intended, and as such may signify all ranges of qualitative differences. In wheat the texture and protein-content of the grain largely determine the uses to which it can be put, and therefore its quality. Speaking generally, highly nitrogenous, glutinous and vitreous samples are most suitable for breadmaking, while cake, pastry and biscuit flours are generally made from soft and starchy grain with a low nitrogen content. There is, however, considerable evidence of differences in the structure and resistance to diastatic activity of the starch grains in particular varieties (Ref. 69). At all events there are more factors affecting wheat quality than are at present known. We now propose to discuss the more recent work on the influence of variety and of environment in determining this quality. An account of the control of baking quality by the baker is given in Ref. 70, and need not be discussed here.

Grain texture (*i.e.*, starchy or vitreous) and protein content are heritable, but as Aamodt and Torrie (Refs. 71 and 72) point out, it is not possible to give any universal scheme for the method of their inheritence; either the starchy or the vitreous character may behave as a partial dominant, while the inheritance of protein content is masked to a considerable extent by environmental conditions. In their experiments the vitreous texture appeared to accompany high nitrogen content, and plants with vitreous grains possessed a high tiller survival (Ref. 73). The association of vitreous grain with a high mineral content, as exemplified by the richness in ash of the hard spring wheats, is referred to by Knayaginichev (Ref. 74). He has found that the flour with the lowest ash content is obtained from winter wheat, which possesses a relatively poor ash percentage in the endosperm, and he suggests that the mineral content of the endosperm would serve, in breeding work, as a useful measure of baking quality.

Growing conditions may affect the grain either through the soil or the climate. Aamodt and Torrie (Refs. 71 and 72) describe the use of a particular soil type for assessing the baking quality of small numbers of plants in hybrid populations. The keeping quality of the flour was also found to be very much reduced by growing wheat on this soil (Ref. 75). The protein content of the grain is subject to considerable fluctuation on different types of soil, and the importance of this fact is referred to in a paper by Eva and Birchard (Ref. 76). By limiting the supply of potassium to wheat plants, McCalla and Woodford (Ref 77) retarded their growth, deteriorated the quality of the grain, and altered the chemical composition of the plants without altering to the same extent that of the grain. Their investigations also showed that the amount of nitrogen entering the grain was directly proportional to the amount absorbed by the plant, so that the nitrogen percentage of the grain was determined by the relation between the yield and the total nitrogen absorbed. Bayfield (Ref. 78) has demonstrated that, in areas where the protein content is too high for the production of flour suitable for biscuits and pastry, phosphatic dressings can reduce the protein content of the grain more efficiently than either nitrogenous or potash fertilizers.

The importance of climatic conditions as affecting grain quality has been studied widely in Canada and the U.S.A. Hopkins (Ref. 79) has subjected a considerable amount of data to statistical analysis and has found that the nitrogen content of the grain was affected by the amount of rain falling in May and June, and that high nitrogen was associated with high temperatures in the later stages of growth. The moisture conditions in the last stages of grain ripening had little effect on the constitution of the grain, and curtailment of the later stages of grain filling had no significant effect on the nitrogen in the grain. In all cases low grain nitrogen was associated with tall straw and high yield, while the yield was clearly affected by the rainfall in May, June and July. Eva and Birchard (Ref. 76) found that high grain nitrogen occurred when the rainfall was low and the temperature high during the growing season, the former condition being the more important.

The effect of frost on the composition of the grain, and on the quality and yield of flour, has been studied by Newton and McCalla (Ref. 80). There appeared to be a critical stage of ripening, when the grain reached fifty-eight per cent. of dry matter, and after which it could be considered mature and was very little affected by frost. In unfrozen grain the yield of flour increased up to the critical stage, after which it remained practically constant whenever the crop was cut, but frost exposure reduced the flour yield more or less in proportion to its severity and the degree of immaturity of the grain. These two investigators maintain that respiration losses before and after the crop is cut largely determine the percentage of nitrogen in the grain, because the ratio of nitrogenous to non-nitrogenous material moving into the grain is practically constant throughout the main period of its development, while respiration takes place solely at the expense of the non-nitrogenous food storage.

It does not require any further elaboration to show the importance of soil and climatic factors in modifying the quality of wheat grain, but it is not always a simple matter to separate the effect of these external factors from the inherent quality of the variety itself. Shutt and Hamilton (Ref. 81) have analyzed the results of twenty years' observations on the wheats of Canada and conclude that, although the variety is responsible for the character of the protein (gluten) in the grain, the environmental conditions determine the amount of the protein. These observations in Canada, and Schnelle's work in Germany (Ref. 82), support the view that wheats of the best baking quality are grown in continental climates with hot, dry and sunny conditions during the later stages of the plant's development. If, therefore, a variety tends to produce the right type of gluten, it will give first-class bread when it is spring sown in areas of low rainfall, high temperature and abundant sunshine. Quickness of growth and rapid ripening appear to favour baking quality, and certain types of wheat lose their quality when they are grown under unsuitable conditions. Analysis of the relative importance of the external and internal factors governing grain quality of wheat is a matter of individual study for every set of conditions, and further discussions of the subject from other countries are given in Refs. 83, 84 and 85.

Some interesting results of observations and experiments on the baking quality of English wheats, from season to season and on different soils, are given in the Reports of the Home Grown Wheat Committee published in the *Journal of the National Institute of Agricultural Botany* (Refs. 86, 87, 88 and 89). The general conclusions reached by the authors are that English varieties, which have been selected for growing in the relatively humid and cool conditions of this country, deteriorate in baking quality in seasons of excessive sunshine and low humidity. Such abnormal conditions do not, however, affect all varieties in the same way or to the same extent. In other words, baking tests have shown that the common varieties of this country are not improved in quality by conditions of low humidity, high temperatures and abundant sunshine, which in Canada are most apt to produce high-quality wheat. Indeed, there is evidence to suggest that high winds and low temperatures during harvest tend to prevent the deterioration of baking quality as judged by some of the usual criteria. Samples above the average were obtained in a season when there was abundant moisture in the soil, owing to a wet May, and when the weather which followed was relatively hot and dry. It is significant that in this particular season Red Fife gave grain equal in quality to No. 1 Manitoba Hard grown in Canada, and showed that, although the stock had been grown in this country for over thirty years, there was no sign of deterioration. Red Fife, however, has neither sufficient standing power nor yield to justify its existence as a variety for general cultivation in this country, and in consequence it continues to be of use only in plant breeding.

Evidence has also been obtained in these experiments to show that different soil types of this country affect the baking quality of wheat. In one season the wheats grown at Kirton, Lincs., were greatly superior to those grown elsewhere, but since this occurred only in the one season no definite conclusion can be drawn. It has also been observed that variation in manurial treatment may affect the baking quality, and that the particular effect is a varietal character. In an experiment designed to compare the influence of intensive manurial treatment with normal farm treatment, on six different varieties, it was found that only one variety—Yeoman II—was improved in quality by the heavy manuring, and this result was obtained in a hot, dry growing season. In most cases, however, the intensive manuring slightly raised the bushel weight, and increased the percentage of dry gluten.

(*b*) A NEW ENGLISH WINTER WHEAT OF GOOD BAKING QUALITY.

In 1935 a new wheat variety was put on the market by the National Institute of Agricultural Botany under the name of "Holdfast." This variety is of high-class baking quality, and a brief account of its origin, behaviour in the field, and quality tests should prove of interest to wheat growers. Holdfast is a hybrid variety which was bred at the Cambridge Plant Breeding Institute from a cross between Yeoman and White Fife. The cross was made in 1920 with the object of improving the quality of Yeoman, or of producing another wheat suitable for bread making. It was not until the eighth generation that four strains were selected for small-scale yield trials, and these trials were conducted for two successive years before three selections were made for further trial by the National Institute of Agricultural Botany. In the field trials and baking tests these three strains gave good results, the strain W 70 E being remarkable for its outstanding baking quality which, in the words of one of the reports, "should satisfy the most exacting requirements of British bakers" (Ref. 86). This strain was discarded, however, on its indifferent type of straw and relatively unsatisfactory yield, and on its general behaviour over the three years' trials the strain W 70 A was adopted for further propagation.

W 70 A has therefore been put on the market as the new variety "Holdfast." Its quality is similar to that of Yeoman II but the grain is smaller white, generally opaque, and has a higher nitrogen percentage. The straw is shorter than that of Yeoman, and is very stiff, while the ear is of the Yeoman type. Holdfast ripens slightly earlier than Yeoman, and may be sown up to the middle of January. It is of the utmost importance to realize that this new variety is not suitable for all conditions but, on account of its exceptionally good straw, it is recommended principally for the richest and most highly farmed land.

(c) DISEASES.

Although stem rust (*Puccinia graminis tritici*) does not cause any damage to wheat grown in this country, it must be referred to because of its importance to the world wheat crop, and because of the general significance, in relation to disease resistance, of investigations on its control. There are two forms of rust resistance in wheat—seedling or physiological resistance, and mature-plant or morphological resistance. Seedling resistance is very complex because of the many physiological forms of rust, but the problem of breeding varieties resistant to as many strains as possible has been simplified since the discovery that resistance to several strains may be controlled by one genetic factor. This means that resistance to groups of strains may be transferred from one variety to another by a single hybridization. Neatby (Ref. 90) has also drawn attention to the fact that resistance to one of the physiological forms (No. 21) is a useful guide to the field reaction towards many other forms; Goulden (Ref. 91) found an association between high yield and susceptibility to this form, and suggests that selection for high yield, in hybrid populations, may be made on this susceptibility and on mature-plant resistance.

One of the most important discoveries of recent years with regard to rust resistance is that mature-plant resistance (which may develop in susceptible seedlings as the plants mature) is inherited simply and quite independently of seedling behaviour. According to Clark (Refs. 92 and 93) there are three genetically distinct types of spring wheat from this point of view, viz. near-immune (there are no completely immune forms), resistant and susceptible. Near-immunity is a dominant character; resistance may be dominant or recessive according to the variety; and susceptibility is generally incompletely dominant to resistance. The dominant near-immune character usually inhibits the dominant susceptible character, and is therefore dominant to both resistance and susceptibility. Although the inheritance of these characters may be simple or may depend on the action of many hereditary factors, it is of great importance, in the breeding of rust resistant forms, that mature-plant resistance can be analyzed in this manner.

A great deal has been done by crossing varieties of *T. vulgare* or bread wheats with one another, to breed rust resistant wheats, but attempts have also been made to solve the problem by crossing different species of wheat. The *vulgare* wheats are characterized by a higher degree of susceptibility to most diseases than are some of the other species (*e.g.*, *T. monococcum* and *T. durum*) which possess fewer chromosomes. The success of these inter-specific crosses is limited by varying degrees of sterility in the first generation (due to the different chromosome numbers of the parents), and by the occurrence of linkage between the factors for disease resistance and those for the undesirable economic characters of the species with fewer chromosomes. But the procedure has great possibilities, for the inheritance of resistance to more than one disease may be controlled by one genetic factor, and forms more resistant than either parent may result. One important example of a successful simple inter-specific cross may be seen in the production of the variety Marquillo which is a high-yielding and rust-resistant form of good baking quality derived from a cross between Marquis (*vulgare*) and Iumillo (*durum*). Kostoff (Ref. 96) has succeeded in making triple inter-specific hybrids, by crossing *monococcum* with *dicoccum* and pollinating the flowers of the resulting plants with *vulgare* pollen. In this way he obtained plants with chromosomes from each species (7 *monococcum*, 14 *dicoccum*, and 21 *vulgare*), and by back-crossing these to a *vulgare* variety, or by selfing them, successfully extracted highly resistant forms. Kostoff also managed to obtain a direct cross between *vulgare* and *monococcum*, and the resulting plants (which possess 35 chromosomes) are being used for further breeding. Somewhat unsuccessful attempts are also being made to utilize *T. Timopheevi*, which possesses a high degree of resistance to a wide range of diseases, in these inter-specific crosses. (See Refs. 94 and 95 for breeding disease-resistant wheat in India.)

Environment affects the relationship of the fungus with the plant that it is attacking, and Hart and Zaleski (Ref. 97) have described the varying influence of the environment on the particular combination of the fungus species or strain and its host variety. Every combination of host and parasite has optimum conditions for its development, and therefore the degree of host resistance will vary from season to season. Hart and Zaleski, for example, found that the wheat variety Hope is more resistant to stem rust form No. 21 in strong sunlight and at high temperatures, while Rudof and Job (Ref. 98) maintain that yellow rust (*Puccinia glumarum*) is most susceptible to high temperatures, brown leaf rust (*Puccinia triticina*) is next, and stem rust (*Puccinia graminis*) is least affected. This conception of a definite host-parasite complex, which is affected in its development by the environment and the varying susceptibility of the rust fungi to changes in the growing conditions, is of extreme importance to the study of disease resistance in general.

The reader is advised to consult Ref. 99 for a good review of the present position of the knowledge of rust infection, spread, control and technique for laboratory work.

Before concluding this discussion of rust resistance it should be mentioned that some of the work on inheritance referred to above describes equally well the position with regard to the bunts and smuts. Clark, for example, maintains that there are varieties of wheat which are near-immune, resistant and susceptible to bunt (Ref. 92), and Kostoff refers to work on covered smut and bunt, in which the crossing of resistant parents resulted in forms more resistant than either parent, a position which often occurs in rust-inheritance work.

In the 1925 and 1928 numbers of this publication a description was given of the damage done by three genera of fungi—*Ophiobolus*, *Fusarium* and *Helminthosporium*, all of which are capable of causing "root-rots" or "foot-rots" in cereals. Apparently *Helminthosporium* has been found on wheat in this country, but does not appear to be of common occurrence, though it is frequently reported from Canada, U.S.A., Australia, and India. There is little doubt that root-rots are due to different fungal pests in different environments, and perhaps to a preponderance of one or the other of the forms mentioned above. In Western Canada, for example, Broadfoot (Ref. 100) maintains that most of the foot-rot is due to *Helminthosporium sativum* and *Fusarium* spp. *Ophiobolus graminis* was not isolated from diseased plants, although there were signs of its attacks. It should be pointed out that *Ophiobolus* is a difficult fungus to culture in the laboratory, and it seems probable that failure to isolate it may be due to faulty laboratory technique.

Interesting work has been done on the effect of soil, climate and cultivation on the incidence of root-rots. Broadfoot (*loc. cit*) found that wheat suffered less from *Helminthosporium* and *Fusarium* attacks when following a summer fallow, or alternating with oats in a two-year rotation, or following oats or sweet clover in a three-year rotation, or when sown late. On the other hand, wheat following wheat, barley or western ryegrass (*Elymus condensatus*) was increasingly affected by these fungi. It is, perhaps, significant that although the incidence of the disease was affected by the rotation and cultivations, the prevalence of *Helminthosporium* and *Fusarium* was entirely unaffected, a fact which suggests that *Ophiobolus* may have been largely responsible. Garrett has done very useful work on the relationship between the prevalence of foot-rots and the soil and climatic conditions in Australia (Refs. 101, 102, 103 and 104). The growth of the foot-rot fungi is apparently very sensitive to the presence of soil micro-organisms, and *Helminthosporium* and *Ophiobolus* can be completely suppressed by certain fungi and bacteria, while *Fusarium* is inhibited by one particular fungus (*Trichoderma lignorum*). Soil-borne diseases must therefore be very strongly affected by the antagonism of the soil micro-organisms, and this antagonism will modify the effect of changes in the soil temperature and moisture on the growth of the root-rot fungi. In Garrett's experiments *Ophioholus* in unsterilized soil was more virulent at low than at high temperatures, while in sterilized soil the reverse was true. Therefore, although the fungus is potentially more active at higher temperatures, the antagonism of the soil micro-organisms prevents this activity, and Garrett suggests that the disappearance of *Ophiobolus* from fallowed soils in S. Australia is due to this antagonism (Ref. 103). The same hypothesis will explain the fact that *Ophiobolus* epidemics are almost entirely confined to light, sandy soils recently taken into cultivation, while on heavier, older-cultivated soils severe attacks are confined to exceptional conditions (such as the ploughing in of diseased stubble). On lighter soils the attacks decrease as the organic matter and soil micro-organisms increase (Ref. 102).

Garrett attaches great importance to the carrying or blowing of pieces of diseased plants in the dispersal of *Ophiobolus* over non-infected areas in Australia (Ref. 104). This would explain the occurrence of small patches of primary infection in crops sown on bare fallow, while the more scattered appearance of "whiteheads" would probably be due to the fungal spores being blown in wet weather. Spore blowing takes place only when conditions are suitable for the quick ripening of the spores on infected areas, and when this is followed by wet weather in the spring the spores are ejected and carried down to the roots. It is significant that in S. Australia "take-all" occurs most abundantly after a dry summer and a wet winter, and that in Canada and Australia there is a marked correlation between high spring rainfall and epidemics of this disease.

Observations made at Woburn in this country suggest that the reaction (acidity) of the soil affects the degree of infection of wheat and barley by *Ophiobolus*, there being little or no "take-all" when the hydrogen-ion figure (pH) was less than five and the degree of infection becoming generally higher as the pH increased (Ref. 105). The addition of sulphate of ammonia, with or without minerals, also appeared to prevent any serious attack by the fungus. From these observations Glynne calculated that *Ophiobolus* can cause a maximum reduction in yield of 42 per cent., but no clear relationship between yield and the degree of "take-all" infection could be established, since high yields were obtained from badly infected plots as well as from healthy ones.

Little has been done to breed varieties of wheat resistant to foot-rot diseases, but an account is given by Pissarev of an inter-specific cross made especially for this purpose (Ref. 106). He crossed a hard or macoroni wheat (*T. durum*) with Emmer wheat (*T. dicoccum*), and obtained forms resistant to *Fusarium* and with good grain.

(*d*) MISCELLANEOUS CONSIDERATIONS.

To conclude this section on wheat investigations, reference may be made to some recent articles on the more general aspects of wheat cultivation. In Ref. 107 an account is given of a wheat conference held at Nebraska, U.S.A., at which a wide range of topics was discussed, a few of which may be here mentioned. Suneson stated that wheat plants had been found to be more cold-resistant when they were just emerging above the ground than later on, when they had started tillering, while bunt-infection appeared to lower the cold-resistance of the plant. Atkins reported some careful statistical measurements of the breaking strength of straw, and concluded that this character was closely associated with the diameter and weight of the straw, the weight of the ears and the weight of the grain. By using a special machine, Dinkle found that "shattering" of the ears occurred most frequently in those varieties which had the widest grain, the shortest awns and the fewest grains per ear. Of these three characters the length of the awn had the greatest effect on shattering. An article by Miêge may also be mentioned while referring to varietal characters. He found that the thickness of the straw, the shape and colour of the ear, and the length of the awn and the teeth on the glumes are the characters which vary most frequently when varieties are grown for any length of time under a changed environment (Ref. 108). These fluctuations were definitely due to the environment and were not inherited, but because the characters mentioned are sometimes associated with important economic and agricultural characters, this aspect of environmental fluctuation is worth noting.

Finally, two useful articles on breeding and genetic work in wheat must be mentioned. The first, by Biffen, is a general and popular account of wheat breeding since 1875, in which he states the problems and the means by which they have been, and still are being, attacked by plant breeders (Ref. 109). The second publication is a very comprehensive bibliography of wheat breeding and genetics for the last forty years, which is really only of direct use to research workers and technical readers (Ref. 110).

V.—VARIETY TRIALS.

The National Institute of Agricultural Botany publishes each year the results of crop trials and investigations which have been conducted under the Institute's supervision at Cambridge and at other centres in the country. It is necessary for such trials to be conducted over several years, and in as many localities as is practicable, for them to have any general application in the country. The data collected from these trials must be subjected to statistical analysis and careful scrutiny before it is possible to draw any conclusions which can be interpreted in terms of agricultural practice. A considerable period of time must therefore elapse between the commencement of such trials and the final publication of results and conclusions. In the most recent number of the Institute's *Journal* are accounts of experiments started in 1931 (Ref. 111).

(*a*) SPRING OAT TRIALS.

An attempt was made in 1931 to conduct co-ordinated trials throughout England and Wales which would yield detailed information concerning the varieties Golden Rain II, Marvellous and Victory when grown in as many centres as possible. By the co-operation of local authorities and agricultural institutions, trials were arranged at 109 centres scattered throughout six regional areas—Northern, Midland, Eastern, South-Eastern, South-Western and Wales. This scheme was the first of its kind, and aimed at securing data on the yield, disease resistance, type of straw, quality of grain, and developmental behaviour under the varying conditions. Some of these detailed observations had to be abandoned, but in 1931 there were ninety-three centres co-operating in this work; owing to the financial crisis of that year, however, these had to be reduced to fifty-one in 1932 and to forty-one in 1933.

Considering the three years together, the varieties gave practically identical average yields in the North, Midland, and Eastern sections, the differences never exceeding 4 per cent. In the South-East and South-West areas, Golden Rain II outyielded Marvellous by 6·2 per cent. and 14·6 per cent. respectively, Victory being intermediate in each case. Golden Rain II and Victory yielded approximately equal amounts of straw, both tending to outyield Marvellous. Although Golden Rain II proved itself to be a higher yielder than Victory, which was next in order of merit, the report concludes that the latter variety is probably just as profitable to grow for sale because of its higher market value and lower percentage of tail corn. On the other hand, the higher yield and better standing powers of Golden Rain II point to its being the most suitable variety to grow for feeding on the farm. One of the most striking results of these trials is that no variety showed itself as outstandingly suited to any particular district or set of conditions, although Golden Rain II outyielded the other two varieties by considerably larger margins under some conditions than others.

In 1934, Golden Rain II was tested in twenty-three counties against Eagle, Star and Progress. The result of the one year's trial showed Eagle to be the heaviest yielder and probably also the strongest-strawed variety. On the other hand, the grain of Eagle is smaller than that of Star, which was next in order of yield, and it is suggested that the latter variety may be the more suitable for sale.

In the three years' trials of Golden Rain II, Marvellous and Victory referred to previously a number of other varieties were included at certain of the centres. Although the amount of data obtained concerning the yields of these supplementary varieties was not sufficient for statistical handling, it is worth recording that none of them yielded significantly better than the average of the three principal varieties.

(*b*) WINTER OATS.

Reference was made to winter hardiness in oats, and to the breeding of new oat varieties, in the article on "Crops and Plant Breeding" last year. An account of trials with winter oats is given in Ref. 112, and although some of the forms tested are at present hybrids, there is much of practical importance in the report. The varieties showing the greatest winter hardiness in field trials and in artificial freezing tests were Grey Winter, Garton's white-grained variety Unique, and a hybrid form. The least hardy varieties were Bountiful, Marvellous and Abundance, while the new oat Resistance (which was then grown under the number 136/17) showed itself to be somewhat hardier than Bountiful.

The results of the observations on the general agricultural value of the named varieties were as follows. Grey Winter proved itself once more to be a variety of the highest quality (low husk percentage) with a moderate yield and a very weak straw, making it very liable to lodge. With regard to Unique, the report states that this variety "had most of the merits and demerits of Grey Winter," *i.e.*, great winter hardiness, weak straw and moderate yield. There is no doubt that Unique is the most winter-hardy white oat available in this country, but it has not the low husk-percentage of Grey Winter. The new variety Resistance (136/17) does not possess the winter hardiness of the two varieties mentioned, and its husk percentage is not low, but it proved itself outstanding for the shortness and strength of its straw and its high yield of grain.

An interesting conclusion emerging from these trials was that market value and feeding value of oat grain must be considered separately. The highest market value was given to a hybrid with a large, fairly plump grain with a moderate husk percentage (28 per cent.), while the lowest market value was placed on a sample with the lowest husk percentage (22·7 per cent.). This latter sample was a long-grained type, however, and possessed a fairly strong awn, and it appears that oat millers prefer a short, plump grain even though the husk percentage is high.

G. D. H. BELL.

School of Agriculture,
Cambridge.

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DISEASES OF ANIMALS: PREVENTION AND TREATMENT.

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I.—BOVINE MASTITIS.

Control of the Disease.

BOVINE MASTITIS or inflammation of the mammary gland was dealt with in a general way in this publication two years ago, while last year special attention was given to the way in which cows become infected, and to the method of spread of the disease. Readers who desire to obtain a full understanding of the information given below concerning prevention and treatment of mastitis would do well, therefore, to consult the articles referred to. It must suffice now to repeat some of the essential points. Several different forms of the disease exist, but a chronic type of infection due to streptococci is responsible for the great bulk of the trouble in milch cows. This form runs an apparently mild course, but as a rule there is slow and progressive destruction of the milk-secreting tissues, and the disease is spread from one cow to another during milking. Unfortunately, the udders of a large proportion of cows are affected in a way which is not obvious, so that, in order to make a complete and satisfactory diagnosis, the milk of each cow in the herd must be examined. There are various ways of attempting this. Simple expedients are: (1) to examine a little milk from each teat in a shallow dish with a blackened surface, in order to see whether fine clots are present; (2) to judge the chemical reaction of the milk by dipping into it a strip of filter paper impregnated with a dye such as bromcresol-purple. The milk from quarters affected with mastitis sometimes contains small flakes or clots and is abnormally alkaline, as shown by a purple tint on the paper. Unfortunately, such methods have their limitations. Some of the drawbacks are that they are applicable only to cows in full milk, that they can be used only for the milk of separate quarters, and that a negative result at one or two tests does not necessarily prove the absence of infection. The only really reliable way of determining whether a cow is healthy or infected is to examine the milk for streptococci, and this, of course, can be done only in a bacteriological laboratory. The demonstration of mastitis streptococci in milk is not, however, always a simple matter, partly owing to the presence of other bacteria; but as the outcome of research during the last few years, there are now available methods which are reliable for detecting and indentifying very small numbers of mastitis streptococci in milk.

Once cows are shown to be affected with mastitis, even though the disease is not obvious, it is important that they should always be milked after the healthy ones. It is unnecessary to eliminate them quickly from the herd, unless, of course, they are of little value, or have mastitis in an advanced form, or are also affected with other diseases such as contagious abortion.

The main purpose of this discussion is to make known the extent to which control of the disease, by milking infected cows last, has been tried in practice, and to record the results achieved. Since 1928 work on this subject has been carried out at the Research Institute of the Royal Veterinary College, London. In 1933 the results with one herd were presented by Minett, Stableforth and Edwards (Ref. 1). This was a self-contained pedigree herd (herd B) and consisted, in June, 1928, of fifty-three Red Poll cows, of which, by the end of the year, ten cows, mostly rather old ones, had been found to be infected; two others were discovered to be infected in 1929. During the first two years the diseased animals were kept on the same premises as the "clean" cattle, but were milked last; afterwards, for reasons of convenience, they were removed to separate premises. Every three or four months milk from each animal in the "clean" portion of the herd was examined in the laboratory for streptococci by the searching methods referred to above, but at no time during the three-and-a-half years of the experiment were the organisms of chronic mastitis found. During all this time the clean herd was being recruited by first-calf heifers born on the farm. This experiment, therefore, was quite successful in confirming the generally accepted belief that the disease is strictly contagious and that, therefore, it should be possible—theoretically at any rate—to control it by the simple procedure of avoiding direct transmission during milking.

In 1935, Stableforth, Edwards and Minett reported results with six other herds (Ref. 2), five of which were self-contained and one (herd A) was being built up of freshly-calved heifers. It is not here possible to give full details, though it ought to be remarked that, for a fair interpretation of the results, details are important. In forming a judgment of the measure of success achieved, the important point is not the number of infected animals remaining in the herd after a certain time (since this must largely depend on the rate of their disposal) but rather the number of new infections arising in the healthy group during the course of the observations. In the case of the first of the six herds, viz., herd I, the owner decided to reduce his stock, and all infected cows, including a few that had become infected since the work started, were promptly sold. Thus, in spite of the high initial incidence of the disease, viz., 55 per cent. of 158 animals, and the fact that for the first eighteen months infected cows were housed in the same shed as the healthy, the disease was eradicated fairly promptly and the herd remained healthy for a period of three years.

Three of the remaining herds, viz., J, K and L, belonged to one owner and were kept on neighbouring premises with separate attendants. Herds J and K, consisting of about forty-five and fifty animals respectively, must first be mentioned. With these, the plan followed was that of removing infected cows to a separate farm. Herds J and K continued to show new infections, though the proportion has steadily fallen while the size of the herds has increased. The results would, no doubt, have been better had it been possible to exercise more strict control. Unfortunately, however, the intervals between herd tests had to be prolonged to about six months, freshly-drafted cows could not be examined at once, and in some cases infected animals could not be removed to the separate farm for some weeks or months. Herd L was formed early in 1933 from freshly-calved heifers, and the milk of each animal was examined every six months. By the end of 1935 this herd contained thirty-one animals and of these two were found to be infected, in 1933 and 1934 respectively, and were promptly removed. With herds A and C the results at first sight appeared to be disappointing, though in both cases the number of new infections declined as the work proceeded. The difficulties of control in these two herds were increased owing to two facts; firstly, a large infected section had to be kept in the same sheds as the clean section, or in adjoining sheds; and, secondly, many of the infected cows were valuable pedigree animals and were, therefore, retained far longer than would ordinarily have been the case. In these two herds a number of transient infections were noted, that is to say, a number of animals were found to be slightly infected on one or two occasions and not subsequently. All such cows, however, were always regarded as belonging to the infected sections.

The conclusions from all this work may be set out as follows: (1) Mastitis streptococci almost always lead to permanent infection of the udder; (2) experience has shown that the disease does not arise "spontaneously," once all known sources of infection are removed. New infections must, therefore, be due to errors in milking or to deficiencies in methods of diagnosis; (3) eradication of contagious streptococcus mastitis may be achieved under certain conditions by the simple expedient of segregating infected cows, or, if that is not possible, by milking them last. The chances of success are greatly increased if infected cows can be got rid of within a reasonable time. When this cannot be done, treatment of the infected udder by infusing into it chemical substances capable of killing the streptococci should prove a useful aid (see below); (4) the formation, where possible, of a separate heifer herd is a measure of the greatest value.

Treatment of the Disease.

One of the earliest methods of treatment to be tried was the milking of infected cows repeatedly and at short intervals. This has the effect of reducing for a time the number of streptococci excreted, and leads to the disappearance of clinical symptoms. The improvement, however, is in the great majority of cases only temporary. Treatment of mastitis by drugs intended to kill the causal organisms has often been tried in the past. The substances have been given in various ways, *e.g.*, by the mouth or by injection into the blood, in the hope that they would be excreted in the milk in effective concentration. They have also been injected directly into the udder through the skin, or infused through the teat canal. From the experience gained it can be said at once that the only route of administration which has been found to be of real value is by the teat canal. Incidentally, this would be the most logical route to use, because the streptococci are situated in the superficial parts of the secretory ducts. There are, however, various difficulties. In the first place, animals selected for treatment must not be at too advanced a stage of the disease, since it is hopeless to restore to normal an udder which has been seriously damaged. Secondly, the chemical substance chosen must fulfil various requirements and, in particular, the concentration used must be capable of killing streptococci without damaging the sensitive tissue of the udder. The more simple chemicals which have been tried, *e.g.*, iodine, hydrogen peroxide, boric acid, carbolic acid, salts of metals (silver, mercury) are too strongly irritant, in the needful concentrations, to be used for disinfecting the interior of the udder. Attention has, therefore, been directed, mainly in Germany and Switzerland, to certain agents of more complex chemical constitution which are known to have high antiseptic action on streptococci and which, in concentrations which are effective, have been found to possess low irritant effects on the udder. These are substances belonging to the so-called acridine series of drugs and the preparations known as "rivanol," "entozon" and "trypaflavin" have been specially investigated.

Treatment by means of udder infusions has been studied by Professor W. Steck of the Veterinary Medical Faculty of the University of Bern (Ref. 3). He has found that there is no simple or standard method by which all apparently suitable cases can be cured. Infected quarters, even those in the same cow, do not respond equally, though, in general, cases of recent infection are more successfully treated than those which are more advanced. Cows may be treated at any stage of lactation or during the first half of the dry period. The first essential in all cases is that, in cows in-milk, the udder should be emptied as thoroughly as possible immediately before the infusion is made. The reason for this is that the acridine dyes form a precipitate with milk and these precipitates not only absorb dye and so prevent its action but also hinder its diffusion into the finer milk-secreting channels. For the same reason, it is inadvisable to inject the whole of the antiseptic fluid at one operation; a small portion should be infused in the first place with the object of washing out the milk sinus at the base of the teat. For the main infusion a large volume of the antiseptic is required and an attempt should be made, by massaging the gland, to bring the fluid into good contact with the more deeply situated tissues. Unfortunately, it is not possible to control satisfactorily the action of the antiseptic for the reason that it is impossible to know in any given case how much of the injected fluid can be withdrawn by an immediate milking of the cow. This places a limit on the strength of dye that can be used for routine purposes, since it is inadvisable to leave too much of the antiseptic too long in the udder. Experience has shown that, contrary to what might have been expected, the most difficult part of the gland to sterilize is the milk sinus and the large milk tubes entering it. The last portion of the fluid injected should, therefore, contain the antiseptic in increased concentration.

Steck (Ref. 4) now recommends the following technique for carrying out udder infusions with trypaflavin. A stock solution of this chemical at 1·0 per cent. strength is made in distilled water or in tap water which has been boiled and then filtered through paper. 12·0 c.c. of the stock solution is added to 1,750 c.c. of boiled and filtered water which has been warmed to body temperature as soon as the cow has been milked out and when everything is ready for the operation. The teats are then cleaned with spirit and 250 c.c. of the fluid are infused into the quarter through a teat syphon. This is merely intended to wash out the milk sinus, and therefore as much as possible of the fluid is immediately removed by drawing the teat. The infusion is then continued until 400 c.c. is left; to this is then added 22 c.c. of the stock solution, when the infusion is completed. Two minutes later the quarter should be milked out, but not more than 500 c.c. should be withdrawn. The whole operation on one quarter should not take more than ten minutes. The cow is thoroughly milked out the same evening and as usual during the following days, the milk being used for calves as long as its appearance remains abnormal. In the dry cow no further intervention is required. In the lactating animal, samples of the milk should be examined ten days later to see whether streptococci are still present and, if this is so, treatment may then be repeated. It is recommended that cows resisting a second treatment should, if possible, be eliminated. The teat syphon should be boiled in water before it is used for a fresh animal. Steck found that by the above method, out of 68 quarters of cows belonging to 8 herds, 78 per cent. were cured at the first treatment. The milk secretion was slightly reduced as a result of treatment but was usually restored to normal by the end of the second week. The results with trypaflavin are considered to be better than those with entozon. With the latter, Steck (Ref. 3) found that 25 out of 41 quarters were sterilized at the first attempt, but only 6 of the remainder were cured by one repeat treatment. Trautwein, Weiszhaupt and Wagner (Ref. 5) in Bavaria have also related their results with entozon. 856 infected quarters in 326 cows belonging to 34 herds were treated. Of these quarters, 41 were cured after one infusion, 539 after two infusions, 128 after three and 25 after four or five infusions. Thus 67 per cent. of the quarters were cured by one or two treatments and 85 per cent. by five treatments or less.

Treatment of infected cows by udder infusions must still be regarded as in the experimental stage. It already appears that treatment may be well worth while in the case of valuable animals, but expense may prove an obstacle to more extended application. It should be emphasized that the treatment is not designed solely for animals clinically affected, but should be used in conjunction with bacteriological tests of the milk and the separation of infected cows as outlined above. Treatment is also intended only for cows suffering from streptococcus mastitis; with other forms of mastitis treatment is not only ineffectual but may even aggravate the condition.

II.—JOHNE'S DISEASE.

This disease has been given its name from the fact that the causal micro-organism was first demonstrated by the late Professor Johne of Dresden. This was in 1895 and it was first suggested that the organisms seen in the mucous lining of the intestine of affected animals were tubercle bacilli of the kind that cause tuberculosis in birds. In 1906 it was recognized by B. Bang in Denmark that the disease was not a form of tuberculosis and this was confirmed a year later by M'Fadyean, who was the first to describe natural cases in cattle in England. Since 1907 reports have appeared which suggest that the disease is widely distributed in England, and it is now certain that on individual farms losses may be so severe that cattle-raising is rendered almost impossible. Accurate information regarding the prevalence and distribution of the disease is lacking, and, indeed, this knowledge could be obtained only by extensive testing of cattle in different parts of the country with johnin, a product analogous to tuberculin. As to the extent of the disease in individual herds, Minett (Ref. 8) has reported full johnin tests of seven herds located in six counties and containing 499 adult animals. In these herds the average incidence, assessed by including both positive and doubtful reactions to the test, worked out at 28 per cent., the extremes being 7 and 57 per cent. Thus it would probably be correct to say that in affected herds an average incidence of about 30 per cent. would be expected to be revealed by johnin testing, the incidence being higher among animals over three or four years of age.

The symptoms shown by cattle in advanced stages of the disease are now well known. They consist of emaciation and persistent diarrhœa, but the appetite is maintained until a few days before death, which is almost the invariable outcome. The symptoms in less advanced cases are not so well recognized and are frequently attributed to such causes as indigestion or exposure to cold. In such cases there are periods of unthriftiness, with or without intermittent attacks of slight diarrhœa; with cows there may be a falling off in the milk yield. Symptoms often appear in an exaggerated form, or may appear for the first time, a few days after calving, especially after the second calf. Testing with johnin has made it clear, however, that months or even years may pass before suggestive symptoms appear and, no doubt, many such animals are disposed of for reasons unconnected with Johne's disease. There is little reason to doubt that under natural conditions infection enters by the mouth, the sources being fodder or drinking water, which may become heavily contaminated by the fæces of diseased animals. Experiment has shown that calves up to the age of six months are particularly susceptible and probably many animals are infected at this time, the appearance of symptoms being delayed until early adult life.

Diagnosis during Life.

The typical advanced case presents little difficulty in this respect, and a diagnosis can often be made with fair certainty by considering the symptoms and history in less advanced cases standing in known infected herds. Attempts have also been made to diagnose such cases by means of a microscopical examination of fæces or of a piece of mucous membrane pinched off from the rectum, but such methods are extremely uncertain.

In 1909, O. Bang (Ref. 9) in Denmark, recommended the use of avian tuberculin for diagnosis. There is no doubt that at least a proportion of cattle affected with Johne's disease react to this kind of tuberculin, and the test is still being used to some extent in the United States. At the present time, however, there appears to be no necessity to use avian tuberculin, firstly because tuberculous animals also are likely to react to it and, secondly, because there is now available the product known as johnin, which is prepared from the bacilli of Johne's disease.

Johnin may be used in various ways; in this country the method of choice is to inject the reagent into the skin of the neck and to repeat the injection at the same spot forty-eight hours later. The procedure, in fact, is similar to that used in the double intradermal tuberculin test and the reaction shown by infected animals is also similar, viz., a diffuse swelling with ill-defined edges, of such a size that the skin may attain twice or thrice its previous thickness.

As to the reliability of johnin for diagnosis, when used by this method, further experience is desirable. In connection with the matter two points really arise, firstly, whether all animals affected with Johne's disease may be expected to react in an unmistakable manner, and, secondly, whether the test is specific, that is, whether animals that are healthy or suffering from other diseases may be expected to react. Evidence on these points has been reported in this country by Dunkin (Ref. 10) and by Minett (Ref. 11) and in Holland by Houthuis (Ref. 12). Dunkin refers to seventeen reactors, of which the fate was known; of these, eight were clinically affected and the remainder were found on *post-mortem* to have the disease. Houthuis tested forty-one cattle with a certain brand of johnin and obtained reactions from twenty-seven. Of these, twenty-five were proved on *post-mortem* to be affected with Johne's disease while two appeared to be affected with tuberculosis only; of the non-reactors, eight were advanced clinical cases of Johne's disease and in four others lesions of this disease were found *post-mortem*. Minett examined fifty-three cattle which had reacted to johnin, of the same brand as that used by Houthuis; of these, thirty-nine were conclusively proved on *post-mortem* examination to be affected with Johne's disease, while there was presumptive evidence of this infection, either from *post-mortem* examination or from the history of the case, in eleven of the remaining fourteen. Further, in these fifty-three animals there was nothing to show that the reactions to johnin were connected with the presence of tuberculosis. Six cattle which had not reacted to johnin were also found *post-mortem* to be affected, but four of these were at an advanced clinical stage. Considered as a whole, the work of these authors goes to show that a positive reaction to johnin is a definite indication of the presence of Johne's disease; that a reaction to johnin is not necessarily related to tubercular infection, and, lastly, that advanced cases of Johne's disease may fail to react, just as it is known that animals with advanced tuberculosis may fail to react to tuberculin. There is no reason to suppose that entirely healthy animals ever react to johnin. There is, however, a possibility that tuberculous animals which are free from Johne's disease but which, at the time of testing happen to be extremely sensitive to tuberculin, may react to johnin, since the tubercle bacillus and the Johne's bacillus belong to the same group of micro-organisms. On this point more information is required, but in the meantime it may be recommended as a safeguard that animals, unless they are known to be free from tuberculosis, should be tested with johnin and tuberculin at the same time.

Control of the Disease.

Treatment.—It is agreed that treatment by drugs is an unsound procedure. The main reason for this is that no drug has been found to be of real value and attempts at treatment are, therefore, not merely a waste of money but lead to infected animals being retained on the farm, so increasing the danger for healthy stock.

Vaccination.—In France, Vallée and Rinjard (Ref. 13) and Rinjard (Ref. 14) have recommended a system of vaccination for suppressing the losses due to Johne's disease. They found that, when healthy cattle were inoculated subcutaneously with an oily mixture containing living Johne's bacilli, lesions in the intestine, such as are found in natural cases of the disease, are not set up. From enquiry among veterinary practitioners who had used the living vaccine, the authors believe that inoculated animals are resistant to natural infection and that they will remain so provided revaccinations are carried out annually. The method has been used extensively in France; up till 1935, 35,000 doses of the vaccine had been issued, but so far no investigations on similar lines have been reported by other workers. It must, however, be said that the system has certain drawbacks. Thus, it has not been established that vaccination leads to eradication of the disease from farms, while inoculated animals react both to johnin and to tuberculin.

Control by hygienic measures, accompanied by johnin-testing.—The ultimate object here is complete eradication of the disease, and the principles involved are those common to other contagious diseases, such as tuberculosis and abortion. In order that the measures adopted may have a reasonable chance of success, attention to detail is necessary and the actual procedure will, of course, vary from farm to farm. Space permits only a brief outline here; for further particulars readers should refer to articles by Dunkin (Refs. 6 and 7) and Minett (Ref. 8). It must be clearly understood that no real improvement can be effected by removing clinical cases as they arise and by disinfecting their immediate surroundings. The first procedure in all cases should be a johnin test, and preferably at the same time a tuberculin test, of all animals twelve months of age and older. All reactors, as well as any other cattle which have a suspicious history, should then be removed to a separate pasture or yard. Clinical cases should, of course, be disposed of at once, but there is no need immediately to get rid of animals simply because they have reacted to johnin. The testing of the "clean" portion of the herd should be repeated at intervals of about three months, so long as circumstances appear to warrant it. Repetition of the testing is even more advisable in the case of Johne's disease than with tuberculosis, since the response of infected animals to johnin is more variable than is the case with tuberculin in tuberculosis. Steps must also be taken, so far as they are practicable under farming conditions, to prevent further infection arising from stalls, yards, pastures and water supplies. Thus pastures should be thoroughly harrowed, and rain and sunlight given time to complete the cleansing process. Ponds form an obvious danger so that, if possible, they should be drained and a pipe-tank system installed. Manure should be spread on cultivated land and not on pasture. In connection with all these precautions it has to be remembered that the Johne's bacillus, like the tubercle bacillus, is relatively resistant to natural destructive agencies, so that fields which have carried infected cattle should be left vacant for a period of, say, six months and, if possible, longer. It is most important that animals should be protected during calfhood. With this object calves, two days after birth, should be removed from their dams to clean pens until they are ready to go into clean yards or on to pastures not occupied by older cattle.

There is not yet sufficient experience to show the extent to which these precautions will be likely to succeed in practice. There can be no question, however, that they will be of benefit, and that serious attempts at control represent a sound financial proposition, especially in herds which are for the most part self-contained. It need only be mentioned, for instance, that the owner is enabled to recognize, and sell for slaughter, infected animals before their value has depreciated. At the same time, it must be recognized that control measures must proceed gradually and the immediate object should be not elimination but a reduction of the mass of infection on the farm to a point at which losses from the disease become tolerable.

III.—INFECTION OF SWINE, SHEEP AND HORSES WITH *BRUCELLA ABORTUS.*

The micro-organism which ordinarily goes by the name of *Brucella abortus*, is that which was first isolated in Denmark in 1896 by the late Professor B. Bang and which has been recognized for a good many years as the most common cause of contagious abortion in cattle. In *Agricultural Research in* 1929 it was pointed out that micro-organisms of the same or of very closely-related groups may cause disease in other species than cattle, viz., in man, goats, swine, sheep, horses and even in fowls. It should be recalled that the disease, when it occurs in man, is known as "undulant fever." At one time this disease was known as Malta or Mediterranean Fever, being caused by that member of the group called *Brucella melitensis*. Fortunately, this form of undulant fever is geographically limited, but it is now clear that a more widely distributed though perhaps rather milder form may be due to *Br. abortus* of the kind which infects cattle and that *Brucella* of the kind which infects pigs may also infect man. This porcine variety of *Brucella* is different in certain respects from both *Br. abortus* (bovine) and *Br. melitensis*. Judged by its effects upon such susceptible animals as guinea-pigs, it has a greater capacity to produce disease than the bovine variety, and it may well be that the undulant fever it sets up in human beings, *e.g.*, in butchers and persons who handle pork carcasses, is relatively severe. The *Brucella* infections are referred to again here because it is desirable to give the more important information regarding some of these infections and to give an account of the situation so far as this country is concerned.

Brucella abortus in Swine.—Disease in swine due to the porcine variety of *Br. abortus* has been met with in a number of European countries, viz., in Russia, Hungary, Germany, Switzerland, France and Denmark, but it is more particularly found in the large pig-raising areas of the United States, where it is widely distributed and where, in the opinion of an experienced observer, it is slowly spreading. The disease has also been met with in Australia and Canada. In Denmark the disease was first recognized in 1929, and by 1931 its existence had been proved in more than 200 herds. A point of importance in connection with the recognition of the disease in fresh centres or countries is that abortion is by no means as common a symptom in pigs as with the bovine disease, though infected sows do at times abort or give birth to weakly or undeveloped dead pigs. On the other hand, abortions in pigs may be due to other bacteria than *Brucella*. In the pig the disease is mainly one of the lymphatic system, though it may also affect the joints—causing lameness or stiffness—the bones of the spine and the generative organs of the male. At other times pigs may be infected without showing any clinical symptoms. Fortunately it tends to be a self-limiting disease, that is to say, it may cease to spread even in the absence of effective control and it would, therefore, seem to be unlikely to attain the high prevalence of contagious abortion in cattle. The existence of the disease can be diagnosed in the same way as with the bovine disease, viz., by means of the blood-serum agglutination test, and it appears that eradication is a relatively easy matter if tests of non-reactors are repeated at monthly intervals for a few months, and if reactors are removed or isolated and the premises disinfected. Although experimentally cattle are susceptible to the porcine variety of *Brucella*, there is little to indicate that natural spread to cattle is of common occurrence, though it should be mentioned that the organism has occasionally been isolated from the cow's udder.

Mainly owing to the danger to human beings, it has naturally been a matter of some importance to obtain precise information as to whether the swine disease occurs in Great Britain, particularly since it may spread in an unsuspected manner without giving rise to noteworthy symptoms. Much light has now been thrown on this question by applying the agglutination test to samples of blood serum from a large number of pigs. Doyle (Ref. 15), working at the Veterinary Laboratory of the Ministry of Agriculture, reported in 1934 upon the examination of blood from 10,474 sows. The blood was taken only from sows which had been bred from, it being considered that, if the disease did exist in this country, it would most likely be found in this class of animal. Moreover, the samples were received from fourteen different sources, so that the results can be taken as reasonably representative of the pig population of Great Britain and Ireland. Of these samples real suspicion attached to four only. In any country where the disease was known to exist samples of blood giving a similar reaction would have been undoubtedly classed as positive and Doyle, therefore, utters a warning against taking an unduly optimistic view of the situation. Nevertheless, until the organism itself is isolated from a pig bred in this country, the question as to the existence here of *Brucella* in this species cannot be answered in the affirmative. Another possible explanation is that the four samples were from pigs infected not with the porcine type of *Br. abortus* but with the common bovine type. Confirmatory evidence of Doyle's work on a smaller scale has been provided by Priestley (Ref. 16) at the Research Institute of the Royal Veterinary College, London, where blood serums from 517 swine were recently examined with negative results. Finally, it should be noted that the observations of Doyle and of Priestley give no support to the view that pigs are commonly infected with *Br. abortus* from cattle, since if this had been the case a considerable proportion of the samples of porcine blood would have shown reactions to the agglutination test.

Brucella abortus in Sheep.—*Brucella* infections in this species of animal are not common except perhaps in certain parts of France. Their main importance, however, arises from the fact that the organism in this case is often *Br. melitensis* which causes a severe kind of undulant fever in human beings, either by direct infection or through the medium of the cow. There is nothing to suggest that *Brucella* infections occur among sheep in this country. Priestley (Ref. 16) has recently examined blood serum from 348 sheep slaughtered at abattoirs, and has failed to find any reactions of significance.

Brucella infection in Horses.—The discovery of *Brucella* infections in horses was unexpected because in cattle these bacteria had always been closely associated with abortion, whereas abortion in mares has for long been recognized as due to bacteria quite unrelated to *Brucella.* The first indication of the truth was provided in 1919 by Fontaine and Lütje (Ref. 17) who were making agglutination tests for glanders with the blood serum of horses in the German army. They observed that blood from horses with fistulous withers often gave positive agglutination reactions with *Br. abortus* and they attributed a certain causal importance to this organism. It was not, however, until 1928 that information of a quite definite nature was obtained, when the French workers, Rinjard and Hilger (Ref. 18), succeeded in identifying *Br. abortus* in the pus of two cases of fistulous withers among seventeen horses so affected which reacted to the agglutination test. Since 1928 similar findings have been reported from Russia, Sweden, Holland, England, the United States and Australia. In Holland, van der Hoeden (Ref. 19) reported seventy-one out of 424 horses as giving definite reactions to the agglutination test. He isolated the bovine variety of *Br. abortus* from nine out of fifteen samples of pus from cases of fistulous withers and poll-evil. Fitch, Bishop and Boyd (Ref. 20), in Minnesota, found forty-eight reactors among sixty-one horses with fistulous withers or poll-evil, and of samples of pus from 31 cases seven were proved to contain *Br. abortus.* In East Prussia, Hieronymi and Gilde (Ref. 21) found that forty-six out of fifty-three horses with poll-evil or fistulous withers gave definite reactions to the agglutination test. In fourteen cases the bovine variety of *Br. abortus* was isolated in pure culture from the previously unopened swellings. In England, Duff (Ref. 22) was the first to isolate *Br. abortus* from an abscess of the withers of a horse whose blood serum reacted strongly to the agglutination test. Meanwhile, a number of observers have reported an absence of agglutination reaction in horses for which there was no history of suppuration. It has thus been clearly established that *Br. abortus* is often associated with suppurative conditions in horses, more particularly with those which are situated in the neighbourhoods of the poll and of the withers. There is, moreover, definite evidence that *Br. abortus* may be the primary cause of such suppurations, as is shown by the numerous occasions when the organism has been found in the swellings unaccompanied by other bacteria. Further observation has shown that the disease in horses does not always show itself as a local suppuration. There may be general symptoms of a mild nature, namely, slight fever, malaise, joint swellings ; or, again, the agglutination test may reveal the animal as infected over months or years, though showing no active signs of disease. As to the method of infection in such cases, it is believed that, as is the case with cattle, *Brucella* enters the body by way of the digestive tract. This belief is supported by the common absence of any history or signs of local injury to the skin where the swellings appear. Evidence as to the source of the infection has been provided in two ways. Firstly, it has been discovered that the great majority of the *Brucella* strains which have been cultivated from horses are of the bovine variety of *Br. abortus*. In the United States alone have porcine strains of *Br. abortus* been reported in horses. Secondly, it has been observed that cases of fistulous withers are very much more common among country horses than among town horses. It may be remarked here that in 1922 W. R. Davis (Ref 23), an English veterinarian of considerable experience in horse practice, advanced the view that "a hundred agricultural horses are affected with fistulous withers and poll-evil for every one used constantly in town work—and *never turned out to grass*." Moreover, Davis did not recall a single instance where these suppurative conditions could be traced directly to injury, an observation which has been confirmed by others. The general conclusion, therefore, is that horses become infected through direct or indirect contact with cattle affected with contagious abortion. The main point in prevention is thus obvious.

As to the occurrence of the disease among horses in Great Britain, certain information has been accumulated by Priestley (Ref. 16). He examined by the agglutination test blood samples from 569 horses, viz., 264 from army horses, fifty from horses in a country district and 255 collected at the abattoir. The latter, no doubt, included both town and country horses. It is pointed out that in the interpretation of the test there is the difficulty that one cannot be quite sure of the lowest strength of reaction which should be regarded as positive. If, however, one applies the same criteria in this respect as are used in testing blood from cattle, 14 per cent. of the abattoir samples were positive and 20 per cent. were suspicious. The proportion of positive reactions was noted to rise with the age of the animals and, as the abattoir animals were mostly aged and worn out, it is considered that figures for the army and country horses are more representative of the country as a whole. These figures were 4 per cent. positive reactions and 15 per cent. suspicious.

One further point of interest in connection with disease of the withers and poll of horses is to be mentioned. Several years ago there were encountered in the main supporting ligament of the neck, and especially in the neighbourhood of the withers and poll, parasitic thread worms; these apparently are not at all uncommon and they may give rise to obvious swelling of the parts or cause no noticeable change during life. Study of the life history of the worm by J. S. Steward (Ref. 24), in Herefordshire, has shown that the adult forms of the parasite are found in the neck ligament and the embryos in the skin of this region. Part of the life cycle of the worm takes place within a midge belonging to a species of *Culicoides* which is found about farmyards. The embryo worms are taken in by the midge during the sucking of blood and they develop in its body, during the course of about twenty-four to twenty-five days, into forms which are again capable of infecting horses. Within the neck ligaments the life cycle is continued. In view of the fact that *Br. abortus* has a tendency to cause suppuration in this area the question has arisen whether the two parasites act together in causing disease or whether their existence in this situation is entirely coincidental. At the moment this question cannot be satisfactorily answered, but the view that there is no essential interdependence is supported by an experiment made by Steward. A horse which was known to be carrying the worms in its neck ligament, but without the presence of any obvious disease, was injected intravenously with a large dose of culture of *Br. abortus*. The animal was killed about twelve weeks later and the worms were found without difficulty, while there was no sign of any disease commencing at the poll or withers.

IV. "FOWL PARALYSIS" OR LYMPHOMATOSIS OF FOWLS.

Most breeders of poultry stock will probably be aware of the condition which is commonly referred to as fowl paralysis. The first adequate description is that by Marek in Austria in 1907, though it is only within the past ten years that much attention has been paid to the condition, the existence of which has now been reported in many countries.

The disease shows itself as a wasting and consequent weakness of certain muscles, especially those of the wings and legs. At first there may merely be drooping of one wing, slight lameness of one leg, or slight incoordination of movement; but the condition usually tends to be progressive and birds finally die in a helpless state. The appetite is maintained, and life may be considerably prolonged by placing food within the bird's reach. On examination after death, the principal feature of the typical disease is the presence in some of the nerves, and especially in the roots of the nerves supplying the wings and legs, of accumulations or infiltrations of body cells known as "lymphoidal cells," and it is these which, by pressure upon the fibres making up the nerve, lead to paralysis of the wing or leg muscles. It follows that the severity of the symptoms will depend largely upon the extent of these infiltrations. In birds which have been showing symptoms for some little time, diagnosis is a relatively easy matter because even to the naked eye the nerve roots, often at one side of the body, are seen to be markedly enlarged as a result of these cell accumulations. Such a condition can be called "neurolymphomatosis." Further investigation, however, has shown that accumulations of lymphoidal cells may be present in such organs as the ovary, testis and liver, with or without involving nerve tissue, and that, in consequence, tumour-like masses may be found in the organs mentioned. Such a condition can be called "lymphomatosis." It appears to be better, in fact, to adopt the more comprehensive term "lymphomatosis" for all conditions in which these lymphoidal cells are present, irrespective of the particular body structure in which they occur. The term "fowl paralysis" is unsatisfactory—firstly, because the presence of lymphoidal cells, even when infiltrating nerve, may not be accompanied by clear symptoms of paralysis, and, secondly, because muscular weakness or paralysis in fowls may be due to causes unconnected with lymphomatosis.

As already indicated, in advanced cases it is not a difficult matter to verify the true nature of the disease at a *post-mortem* examination. In less advanced cases, for instance where a number of the birds merely show drooping of one wing, it may be necessary to make *post-mortem* examinations of several birds, and even to make microscopical preparations of the nerves, before a diagnosis can be made. It is sometimes believed that an alteration of the colour of the eyes—actually a dullness or greyness of the iris (the contractile membrane which surrounds the pupil)—is indicative of lymphomatosis. While there is reason to believe that in many cases this change in colour is due to the presence of the characteristic lymphoidal cells, the change is not always related to lymphomatosis. Nevertheless, there is undoubted evidence that changes in the eyes, including those which produce so-called "epidemic blindness" in fowls, should be looked upon as very suspicious of lymphomatosis.

The disease is usually seen in birds between the ages of two and twelve months, though cases have been recorded in birds two years old or even rather older. It may occur in both sexes, and often appears at some particular period, *e.g.*, at the beginning of laying, just after moulting, or, in cockerels, at the end of a breeding season.

It is commonly believed that lymphomatosis is widespread and the cause of considerable loss on certain farms. Estimates of its incidence vary according to the observers' views on the nature of the disease, but, of birds presented for routine *post mortem* examination, from 5 to 20 per cent. have been set down as affected.

Many attempts have been made to elucidate the cause of lymphomatosis, but so far without definite success. A formerly supposed direct connection between lymphomatosis and intestinal parasites, such as coccidia, has been disproved in more than one quarter by showing that the disease can develop in stocks known to be completely free from such parasites. The disease is not due to bacteria, and there is little or nothing to show that spread can occur by simple contact between affected and healthy birds. It has been suggested that the disease is due to a virus, that is, to a living agent too small to be seen with the microscope, and many efforts have been made to demonstrate this by inoculating presumably healthy birds at different ages with material from diseased nerves or other tissues. If the cause is a virus, it should be possible to set up the disease in this way. Experiments of this sort, however, have been inconclusive; while some of the inoculated birds have developed lymphomatosis, control birds which have been left uninoculated, or which have been inoculated with presumably normal tissues, have contracted the disease, though usually in smaller proportion and at a later period. In the face of these difficulties, and with the knowledge that on many farms the disease tends to appear in birds of certain strains or families only, while birds of other breeds, hatched and reared under exactly the same conditions, remain unaffected, it has been suggested that the tendency to produce accumulations of lymphoidal cells is a hereditary character which is enhanced by different external stimuli, including, for instance, nutritional factors. At present this is little more than a hypothesis, but it is being used as a basis for investigation. Such a view, if correct, might explain why, in a particular strain, some breeding birds show no obvious symptoms and yet the progeny develop typical symptoms of the disease.

With the present lack of knowledge, little of decisive value can be said on the subject of prevention and treatment. It is said that one point in prevention is to provide abundant green food during early life, and it is also claimed that symptoms can sometimes be relieved in early cases by forcible feeding with green food such as lettuce. The value of the method is uncertain, and it was carried out on the assumption that the disease was due, perhaps indirectly, to lack of certain vitamins. The problem of preventing the appearance of the disease in previously free stocks is, of course, of main importance. There is a certain amount of evidence that lymphomatosis, or at least a predisposition to this condition, is transmitted from parent to offspring through the egg, and that the disease has been introduced into clean stocks, or into previously clean countries, by the purchase of eggs for hatching or of day-old chicks. Probably the best advice that can be given, therefore, is that breeders should take all possible steps to obtain breeding birds from stocks which have been free from the disease for several generations. In addition, the affected flock should be examined periodically, and all ailing birds eliminated; it is also advisable to avoid breeding from the survivors of an outbreak.

A clear statement of the present position regarding lymphomatosis, prepared by Mr. T. Dalling of the Wellcome Physiological Research Laboratories, Beckenham, will shortly be published by the Bureau of Animal Health (New Haw, Weybridge, Surrey). The article will be accompanied by full references to the literature on the subject.

V. THE RESISTANCE OF ANIMALS TO WORM PARASITES.

By E. L. Taylor, Veterinary Laboratory, Ministry of Agriculture and Fisheries.

The nature of research work in parasitology has changed very considerably during the past few years, and since the last contribution on the subject appeared in this series in 1931 (Ref. 25) there has been a marked tendency for investigators to transfer their attention from the parasite to the host[1] and to consider the mechanism of disease production rather than the anatomy, classification and life histories of the parasites.

There is a widespread belief that parasitic worms are essentially harmful to their hosts and that to find an animal infested with worms is tantamount to a diagnosis of disease. This, however, is an erroneous view, as almost all of the larger parasites have adapted themselves so perfectly to their proper host that they are able to carry on their normal processes without causing any disturbance to health.

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[1] The animal or bird in which a parasite is living is termed the "host" of the parasite.

This adaption of parasite to host and host to parasite has progressed throughout millions of years and is now a perfect partnership; as each advance in the defence mechanism of the host has been made, the parasite has been forced to develop a counteraction, extinction being the only alternative. Innumerable modifications must have taken place in this way, and, at the present time, the relationships of the mechanisms for the attack of the parasite, on the one hand, and for the defence of the host, on the other, must be very complex indeed.

It is with the investigation of this association that parasitologists are particularly concerned at this juncture, and publications on the manifestations of host resistance have been very numerous during the last few years (Refs. 26, 27, 28 and 29).

The resistance of an animal to an invasion by parasitic worms may be exhibited in a variety of ways; it may be so strong and so effective as to prevent the worms from becoming established at all, or, if developed when the parasites are already present, it may bring about their death and subsequent expulsion from the body. In some instances, although unable to cause the death and expulsion of parasites already present, the resistance may be able to prevent any further invasion by the same kind of parasite, and at other times it may manifest itself in still more moderate ways—by retarding the growth of the worms or causing a decrease in their egg production. It involves the three related phenomena, "natural immunity," "age immunity" and "acquired immunity."

Natural immunity can be described as an inborn incompatability between a species of parasite and a species of host and, since the adaption of parasite and host is so perfect in most instances, it may be regarded as the absence of one or several of those characteristics which render a certain kind of host a suitable habitat for a certain kind of parasite. This immunity is highly specific and prevents the development of all except the particular species of parasite which are adapted to life in any given kind of animal; every species of worm, with very few exceptions, being restricted to one closely allied group of animals: cattle, for instance, are susceptible to infection by many of the parasitic worms of sheep, but not to those of horses or pigs. The selective power of this natural immunity is so remarkable that an animal may be susceptible to one *strain* of a certain species of parasite but not to another. Thus pigs are susceptible to the round worm *Ascaris lumbricoides* of the pig strain, but not to the human strain of the same species; and dogs are susceptible to the dog strain of a certain species of hookworm but not to the cat strain of the same species.

Age immunity.—It is clear to the casual observer that young animals in general are more susceptible to infection with parasitic worms than are adults. Colts die of red-worm disease, calves of husk, and lambs of parasitic gastritis, while adults grazing the same pastures remain quite healthy.

Age immunity may be regarded as a particular example of natural immunity, wherein the resistance does not develop until an animal has reached a certain stage of maturity. Perhaps the best example is seen in the association of the gape-worm with chickens, which easily acquire infection with this parasite when they are young, but either cannot be infected at all or only with great difficulty when once they have reached the age of six or eight weeks. Similar reactions have been observed in connection with round-worm infection in chickens, hook-worm infection in dogs, two different kinds of worm infections of white rats and infection with the several species of worms which cause parasitic gastritis in sheep.

Acquired immunity.—This type of resistance is dependent upon previous infection and many observations of its occurrence in association with parasitic worms have been recorded. In most instances the acquired resistance is only relative, but is sufficiently powerful to play an important part in the protection of individual animals, and a still more powerful part, where herds are concerned, in hampering an increase of the parasites in animals which are grazing on a limited area of pasture.

Quite a powerful acquired immunity has been observed to develop in rats infected with *Trichinella spiralis*, the nematode worm which makes the eating of uncooked pork dangerous to man in many foreign countries. Rats which receive several small doses of the larvæ of this worm become very resistant to a subsequent test dose of the same larvæ.

In following the course of an infestation of sheep with the "twisted wire-worm" by estimations of the numbers of eggs passed in the fæces, the output of eggs has been observed gradually to increase to a high figure and afterwards to diminish suddenly, until almost reduced to zero, during which time most of the worms are expelled. A similar crisis has been found to occur in the infection of dogs with hook-worms and in the infection of rabbits with a small intestinal worm similar to those causing parasitic gastritis in lambs. In this last mentioned instance, it was found that no such sudden fall in the egg output occurred if one large dose only was given, instead of a number of small ones, but that infestation diminished at a more or less constant rate throughout a period of forty-nine weeks before it was lost altogether.

Acquired immunity to parasitic worms appears to be highly specific, and it has been observed, for example, that infestation with a certain minute worm in the dog (*S. fülleborni*) does not confer any immunity against a subsequent infestation with a closely allied worm, *S. stercoralis*; that dogs repeatedly dosed with a certain hook-worm, *Uncinaria stenocephale*, until they become highly resistant to further infection with that species, do not at the same time acquire a resistance to another closely allied hook-worm, *Ancylostoma caninum*; and that sheep infected with various species of the small worms which cause parasitic gastritis develop a resistance to the various species at different times.

Artificial Production of Acquired Immunity.—Some attempts have been made to stimulate the development of an immunity by the inoculation of worm fluids and dried powdered worm material, with the ultimate view of preventing worm diseases by the artificial production of resistance. Mice have been successfully immunized in this way against a certain worm cyst in the liver; dogs have been immunized against a small tapeworm (*Echinococcus granulosus*) by means of an injection of cyst material from sheep, and rabbits have been rendered resistant to liver fluke by injection of the dried and powdered parasite; in no case, however, does the immunity produced by these methods appear to have been of a very strong kind.

Passive Immunity.—A few attempts have been made to transfer immunity from one animal to another by inoculation of the body fluids of the immune animal into the susceptible one. This process is known as passive immunization, and has been successfully demonstrated in several different infestations of laboratory animals, a reasonable degree of immunity having been obtained by injections of the blood serum of animals of the same or of different species which have been rendered immune either through injection of dead worm material or through actual infestation.

Although these several experiments on artificial immunization show that the resistance of an animal to parasitic worms can be artificially stimulated, or can be transferred from another animal by means of an inoculation of blood serum, it is doubtful whether these methods will ever have any important practical applications in the prevention of worm diseases. Even if the immunity conferred were of a very powerful type the difficulty in obtaining the necessary worm material would not be easily overcome; parasitic worms cannot be grown in test tubes in an incubator as the bacterial microbes of disease can, and it would be necessary to collect all the required material from infected animals.

Breed Immunity.—Very little reliable information has been obtained on this point, the only controlled observations referring to a worm infestation in fowls. In these experiments it was found that Rhode Island Reds, Plymouth Rocks and White Minorcas are more resistant to infection with the large round-worm than are Buff Orpingtons and White Leghorns. Of the less reliable type of information coming from field observations, it might be stated that there is a widespread belief in the south-eastern counties that the Romney Marsh breed of sheep is particularly resistant to the worms which cause parasitic gastritis, and that the Down breeds are particularly susceptible; and it has been observed in naturally occurring outbreaks of disease that the Channel Island breeds of cattle are more susceptible to infestation with the parasitic worms which cause husk than are Shorthorns.

Mechanism of the Immunity.—Although we are now in possession of these several facts on the manifestation of the resistance to parasites, we know practically nothing of the way in which it is brought about. There are, however, one or two interesting observations on the site at which the immunity reactions take place in the host animal.

Successful transference of immunity through inoculation of blood serum taken from immune animals, to which reference has already been made, suggests that the special substance which renders the animal immune resides in the blood and is carried by it to every part of the body, but other observations show that this is not always so. One observer found that larvæ of the minute worm *Strongyloides stercoralis* were able to penetrate the skin of an immune dog and reach the intestine before the defence mechanism (immunity) of the dog began to take effect, suggesting that the immunity in this instance resides somewhere in the intestine itself. The natural immunity of fowls to a certain larval worm in the muscle (*Trichinella*) appears to depend upon some action in the intestine, as fowls cannot be infected with these worms by mouth; if, however, the larvæ are injected subcutaneously they are able to invade the muscles, just as they invade the muscles of mammals when taken in by mouth. Puppies born of immune mothers are found to be susceptible to infection with hook-worms even before they are born, and rats which are immunized against *Trichinella*, so that these worms will not develop in the bowel, are nevertheless susceptible to the development of the worms in the uterus. There are thus seen to be several observations which suggest that the immunity is often of a local rather than a general type and is associated with certain special parts of the animal's body rather than with the blood.

Immunity and Nutrition.—The resistance of an immune host to animal parasites is only of a relative nature. In most instances it can be broken down relatively easily, and a deficiency in some essential food requirement, or merely a low diet, may have a very marked influence in this direction. To mention one or two of the observations on this point, the resistance of chickens to the large round-worm has been observed to be markedly lowered by a deficiency of vitamin "A" in the diet, dogs kept for a prolonged period on a deficient diet become susceptible to the cat strain of hook-worms, and cats under like circumstances become susceptible to the dog strain. Again, a low diet has been found to cause a resistant sheep to become susceptible to infection with the parasitic worms which cause parasitic gastritis, and also to cause the worms already present to produce five times as many eggs as they were able to do before the beginning of the low-diet period. Many other experimental observations on the effect of a low or deficient diet in breaking down an immunity to parasitic worms have been recorded, and it seems probable that nutritional deficiencies and diseases caused by parasitic worms in farm animals are closely connected.

In conclusion, it may be said that although comparatively little is known about this very complex subject of immunity to animal parasites, it appears to be of the same general nature as immunity to bacteria and filterable viruses of disease, and represents a specific defence mechanism of the host. The most powerful immunity which has yet been demonstrated against parasitic worms is not nearly so strong as the immunity which develops against some bacterial infections, and it is very doubtful whether anything of value in the nature of a protective vaccine or curative serum will be found in the near future. The immunity, although only of relative potency, is, however, of great value in checking the multiplication of parasites when animals are herded together on limited pasture or grouped in pens and, although unknown to the average farmer, it is exploited by him to great advantage in the proper management of farm stock.

F. C. MINETT.

Research Institute in Animal Pathology,
Royal Veterinary College,
London, N.W.1.

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FARM IMPLEMENTS AND MACHINERY.

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I.—Power Farming.

Many of the papers that have been discussed under this heading in recent numbers of the *Farmer's Guide* have been open to criticism on the grounds that, however impressively they have argued the case for mechanization, they have nevertheless left the general run of British farming rather on one side. They have dealt in the main with farms much larger than are common in this country and with farming systems too much restricted in scope to be at all generally adopted. This year, however, a very welcome attempt to discuss mechanization in relation to more everyday farming is to be found in the papers read at a Conference held in Oxford in January (Ref. 1). The subject of the Conference was "Mechanization in Mixed Farming," and throughout the proceedings the special needs of medium-sized holdings of not more than 500 acres were kept definitely in mind. Some of the papers need only brief reference here, since they discussed problems associated with mechanized mixed farming in general terms, and without specific reference to equipment. They include a paper by Bridges (Ref. 1*a*) comparing specialized and mixed farming from an economic standpoint; a discussion of rotations by Sanders (Ref. 1*b*); and two papers on methods of handling live stock by Hollis (Ref. 1*c*) and Abbott (Ref. 1*d*). Of these papers, it may, in general, be remarked that although none of the writers concerned envisages any very revolutionary changes in general husbandry, none of them sees any insuperable difficulty in the way of an extended use of power-farming methods.

It may be mentioned here that a general sketch of the kind of mechanization considered in the Conference papers has been given by the present writer in a paper written mainly for the information of overseas readers (Ref. 2).

In the same series Skilbeck (Ref. 1*e*) retells and extends the story of the Long Wittenham farm which has been referred to in earlier numbers of the *Farmer's Guide.* Trial acreages of vegetable crops and of seeds for hay have proved sufficiently successful for both now to be regarded as permanent features in the cropping system. The vegetables give an outlet for straw —converted to dung by an indoor pig herd—while both vegetables and hay make use of surplus labour during the summer. Skilbeck considers that there is the further ground for extending the seeds ley that bare fallows, which on this farm cost about £2 5*s.* per acre to make, are not effective in preventing the spread of annual weeds, particularly in a dry season. As other writers have noted, continuous corn growing and the use of combines make the control of annual weeds a very serious problem on light land farms. Another point brought out in this paper is the difficulty of carrying out, in practice, the idea—attractive enough on paper—of spreading out the harvest by planting over an extended period. When tractors and wide drills are available a proportion of the autumn sowing can be delayed, without great risk, even up to the end of November. But it would seem that in a normal season all the wheat ripens at much the same time whenever it is sown.

The rest of the papers read at the Oxford Conference were concerned mainly with equipment for special purposes and can therefore conveniently be considered later in the particular sections to which they belong. Taken as a whole, they go a long way towards demonstrating that power-farming methods are available for dealing with a very wide range of products. Nevertheless, where land is suited to it, specialized corn growing is still the simplest initial solution of the mechanization problem, and it is fairly certain that the number of corn specialist farms will increase. Any one who is thinking of starting such an enterprise will find a paper by Schwind (Ref. 3) full of interest. It is a simply written but very detailed account of how the author started his own farm, and includes particulars of all the equipment and its cost. It also describes the first year's working and the changes in equipment that resulted from the experience gained. The fact that these changes were not very numerous may be taken to indicate that the venture was well planned in the beginning. Schwind's farm of nearly 700 acres consists mainly of rather heavy land. This is probably the first occasion on which land of this type has been deliberately chosen for full mechanization, while the fact that track-laying tractors are not considered necessary is also noteworthy. North (Ref. 4) has also given an account of the working of his farm. This, too, is confined at present to cereal growing but has been in operation for nearly four years. One point to which he draws special attention is the difference in certain operations between the rate of working achieved in practice by a given outfit and the theoretical rate that would be deduced from a consideration of its working width and the nominal speed of the tractor. Two tractor ploughs which in theory should be capable of covering an acre and half an acre per hour respectively did not average more than half an acre an hour between them over a full year's work. Again, a 12-foot combine harvester, which at three miles per hour should cover over four acres per hour, actually averaged, over three seasons, rather less than an acre and a half per hour. So many different considerations may affect rates of harvesting that a wide difference between theoretical and practical outputs is to be expected. These considerations, however, do not affect ploughing to anything like the same extent, and most farmers with tractor experience would consider that North's ploughing returns are unduly low.

Some interesting general particulars about costs of equipment are given by Bridges and Whitby (Ref. 5) in a paper describing a survey of nineteen mechanized farms, all of which use combine harvesters, but which nevertheless vary fairly widely in cropping. The initial cost of equipment averaged £3 12*s.* per acre but varied on different farms from £2 16*s.* to £5 9*s.* The wide variation was due partly to differences in the size of farm—the equipment of small farms costs rather more in proportion than that of large ones—and partly to the fact that second-hand machines were sometimes purchased. Also the farms are in different stages of development, and not all of them are as yet quite fully equipped. Of the total capital expenditure 35·3 per cent. was accounted for by purchases of tractors, 40·5 per cent was spent on harvest equipment, 17·1 per cent. on field implements, and 7·0 per cent. on other machinery.

II.—TRACTORS.

On the nineteen farms considered by Bridges and Whitby in the paper already quoted, fifty-three tractors and forty-two horses are used on a total arable acreage of nearly 12,000 acres. Twenty of the tractors are of between 10 and 15 drawbar h.p., twenty-nine of between 15 and 25 h.p., while only four are large tractors of over 25 h.p. Having regard to the fact that all these farms use combine harvesters, for each of which one tractor of at least 15 h.p. is a necessity, it is clear that there is no tendency, even on large and mainly specialized farms, towards very large machines. A rough average drawn from these figures shows that power equivalent to that of one horse and one 25 h.p. tractor is used for every 300 acres of arable land. Except in one instance, no information is given on the number of horses that the tractors have replaced. In the one case—which by inference from the various tables given appears to be a farm of 647 acres carrying both sheep and pigs—a maximum of twenty horses has gradually been replaced entirely by two medium-sized and one small tractor.

A good deal of information regarding the working of tractors on less completely mechanized farms is given in two papers by Lee (Ref. 6), and by Witney and Maxwell (Ref. 7). Lee's paper is based on cost records of a number of tractors over a period of about fourteen years. How many different tractors were actually recorded is not at all clear, nor is any direct information given as to their size. However, the records must have concerned at least thirteen machines, and it is probable that most of them were of the 10–15 h.p. class. Over the whole period, 1920–33, the average hourly cost (excluding the wages of the driver) came out at 2*s*. 7*d*. Since it is shown that costs were appreciably higher during the early years of the period—because both the machines themselves and the fuel were more expensive—it is to be presumed that the average figure for a similar tractor to-day would be rather lower. Individual costs varied from 2*s*. 1*d*. to 3*s*. A comparison between two groups of these tractors, one of which averaged 1,045 hours' work per annum and the other only 420 hours, is held to show that the number of hours worked has no influence on the hourly cost. This is a result with which most people of experience will agree, but it is curious that it should have been arrived at in this particular paper since depreciation has been estimated on a purely conventional basis. Information is also given about the costs and rates of working in different operations. The tractors averaged 575 hours' work per year, the times spent on particular types of work being as follows: ploughing, 154 hours; cultivating and dragging, 178 hours; harrowing and rolling, 62 hours; haymaking, 27 hours; binding, 56 hours; and belt work, 78 hours. Averaging each tractor over the whole period, ploughing was done at rates varying from 0·25 to 0·4 acres per hour and at prices varying from 7*s*. 8*d*. to 14*s*. 5*d*. per acre. The mean overall rate of cultivating was about one acre per hour and the cost about 3*s*. 3*d*. per acre. Comparison of these figures with the costs of horse ploughing on the same farms does not show as great a difference as most tractor users would expect. Indeed, where two-furrow horse ploughs were used the saving of the tractor was negligible, while in other cases where a definite difference in costs is shown it is suggested that the horses undertook the heavier work.

The usefulness of Lee's figures as a guide to present-day tractor costs is diminished, firstly, because they are based on a long period of years during which values have greatly diminished, and, secondly, because a large proportion of cheaply-bought second-hand tractors are included. When conventional estimates of depreciation are used in such circumstances the results are liable to be misleading if any attempt is made to apply them generally. One interesting fact, however, emerges—that the lower depreciation figures for second-hand machines were frequently offset by higher repair costs. Second-hand machines were not, in fact, as good investments as they may have appeared.

The figures given by Witney and Maxwell are rather more up-to-date since they refer to the working, during 1935–36, of thirty-three tractors, most of which were not more than three years old. An unusual, but very welcome, feature of this paper is that it mentions the actual makes of the tractors concerned; most recent papers on machinery have suffered from a ridiculous excess of caution in this respect. The tractors averaged 593 hours of drawbar work per year, ploughing being easily the most common task. Eleven Fordsons averaged 654 hours apiece at an hourly cost (excluding wages) of 2*s.* 0½*d.* The total cost was made up roughly as follows: fuel, 8*d.*; oil, 2*d.*; depreciation, 1*s.*; and repairs, 2*d.* The average age of these tractors was eighteen months and the average fuel consumption 1·12 gallons of paraffin per hour. Results for three International 10/20 and two Case 17/27 tractors are also given. Their average hourly costs were 2*s.* 3*d.* and 1*s.* 9*d.* respectively. Direct comparison between the different types of tractor on the basis of these costs is not possible because the groups, being of different average age, were charged with different amounts for depreciation. There is, however, a definite indication that, especially when the relative power is taken into account, a higher capital expenditure on the power unit may be amply repaid in lower running costs. Eight 10-h.p. tractors, each pulling a two-furrow plough, averaged 0·38 acres per hour over a full year, while two 26-h.p. tractors, pulling 3-furrow ploughs, averaged 0·60 acres. Unless there was a definite difference between the soil types concerned in the two cases, the larger tractors were evidently underloaded. For comparison with the figures mentioned earlier it can be deduced that the average cost of ploughing with the Fordson tractors was about 7*s.* 6*d.* per acre. Since the farms concerned were all situated in Scotland, it can presumably be taken for granted that horse ploughing would have cost appreciably more.

One other reference to costs of tractor ploughing is worth noting. It is given by Lee at the end of his paper and refers to the work on the Long Wittenham farm during two seasons. In 1933 the cost of ploughing 372 acres with track-laying tractors and 4-furrow ploughs averaged 7*s.* 4*d.* per acre. With the same equipment in 1934 the cost of ploughing 780 acres averaged 7*s.* 6*d.* per acre.

The main interest of accurate cost records of this kind is that they provide a standard of comparison for other tractor users. Less favourable costings in individual cases may, of course, be due to heavier land or to awkwardly situated fields. On the other hand, where there is no such obvious external cause, the trouble may be due either to uneconomic loading of the tractor or to bad arrangement of the work. Grossly uneconomical loading can be avoided by attention to the published test figures for the particular tractors concerned, and it was with this object in mind that a recent note on the practical interpretation of such tests was written (Ref. 8).

One point of importance about which very little information has yet been available is the number of horses that ought to be replaced by a tractor of given size. One instance has been given above; another appears in a note by Newman (Ref. 9). Particulars are given of the work done by two tractors in preparing a 65-acre field for sugar beet, and these are compared with an estimate, based on previous experience on the same land, of the horse labour that would have been required to achieve the same result. The tractors twice cultivated, harrowed and rolled the field, and distributed manure over the whole area, in a little over two-and-a-half days. It was estimated that a total of 115 horse days would have been required, in the absence of tractors, for the same series of operations. Making no allowance for the longer effective day worked by the tractors, each machine thus did work equivalent to that of ten-and-a-half horses. High figures such as these are, of course, attainable only on large and more or less specialized farms. On smaller and more mixed farms there are occasions where the indivisibility of the tractor offsets many of its advantages. In jobs like haymaking or beet lifting, for example, it may be essential to have more than one power unit at a time, so that two or three horses, used separately, may be a better proposition than any tractor, however powerful. Short of buying horses just when they are wanted and disposing of them again later—which would be impracticable in most cases—there is no general solution of this kind of difficulty. The economical use of the tractor on small farms depends, therefore, on contriving that the tractor shall take as big a share of the work as possible, so reducing horse-work to the bare minimum. In general, this is largely a matter of devising expedients to suit the needs of individual farms. Some instances are provided in a paper by Wolton (Ref. 1*f*), whose views on the use of a tractor on a small farm have been mentioned on an earlier occasion. He takes the line that a small tractor—presumably of about 10 h.p.—must replace two pairs of horses and that it must, therefore, be adapted to do all the work that these would ordinarily perform. He then explains exactly how a tractor is used on his own farm of 150 acres, of which about 90 acres is arable. Wolton keeps both dairy cows and pigs, and uses two horses in addition to his tractor. It is sufficient here to remark that his tractor is very fully occupied and that his paper describes many ingenious devices which enable him to practise small-scale power-farming without special or expensive equipment.

It has been suggested above that a second-hand tractor may be a doubtful investment, because of its higher repair costs. Another question of interest is, how long is it economical to run a tractor, originally bought new? This question is discussed by Williams (Ref. 10) on the basis of the accurate records of two 15/30 and two 10/20 tractors on a farm in Pennsylvania. Depreciation for each successive year was estimated by the simple means of getting a local dealer to make periodical estimates of the " trade-in " or part-exchange values of the machines, while accurate records of the costs of all repairs were kept. The two classes of tractors were worked, on an average, 1,000 and 1,500 hours per annum respectively. The rather surprising conclusion is reached that after an initial period of some 3,000 hours' work it would make no difference to overall costs whether the tractors were " traded-in " immediately or retained for a further period of anything up to eight years. However, since there is always a possibility that a new machine may have some defect not possessed by the old ones, it is regarded as good business to retain old machines for as long as they will continue to run satisfactorily.

On the more technical side of tractor research a comprehensive bulletin (Ref. 11) summarizing the Iowa work on tractive efficiency is worthy of notice. In the case of wheeled tractors, the effects on overall efficiency of diameter and width of drive wheels, and of the size of lug equipment, have been studied. Increasing the wheel diameter in progressive stages from 38 to 58 inches gave increasing tractive efficiency, the effect being most marked on loose surfaces. On the same type of surface an improvement was also achieved by increasing the effective width of the wheel by means of extension rims. On firm ground no difference was apparent between solid-rim and skeleton wheels, while on loose ground the latter type showed a slight advantage only when there was a tendency for the rim wheels to pack with soil. On loose ground in which spade lugs penetrated completely, an increase in their length increased rolling resistance and generally reduced efficiency. An exception was provided by one case in which the deepest lugs were able to reach a firmer sub-surface. In this case 4- and 5-inch lugs were more efficient than 6- and 7-inch, but less efficient than 9-inch lugs.

Tests with pneumatic-tyred wheels showed a greater overall efficiency than those with steel wheels, but in most cases this advantage was achieved only by a sacrifice of drawbar pull. This result implies that the advantages of pneumatics can be realized in practice only by using smaller implements at higher speeds, and that, therefore, the said advantages may be offset by greater implement wear and a greater loss of time in turning. Finally, the Iowa results indicate, as might be expected, that tracks are much less affected by varying ground conditions than any kind of wheel equipment, and that, in general, they give a greater overall efficiency.

Some Italian work of the same kind is described by Santini (Ref. 12). He concludes that, in general, wheel tractors have more engine power than their wheels can transmit to the drawbar; and that most track-laying tractors could transmit more power than their engines can provide. He goes on to suggest that the power-weight ratio of track-laying machines might be raised by nearly 100 per cent.

Several more papers on pneumatic tyres for tractors have also appeared during the year under review. McCuen and Silver (Ref. 13) give a summary of the many comparative tests between pneumatic and steel wheels which have been carried out in the United States, but add little of importance to previous papers on the subject. In any case, pneumatic tyres have now got beyond the stage at which comparative tests matter very much. The value of pneumatics in practice depends on the little odds and ends of work that they can do better than any other type of equipment, and their value from this point of view makes certain their continued popularity—regardless of any defects in their overall performance. Nevertheless, information is still sought about the exact size and type of pneumatic tyre that is most efficient in practice. This forms the subject of a paper by Samuelson, Hurlbut and Smith (Ref. 14) and a note by Clyde (Ref. 15). The conclusions reached are not very clear, but it appears to be certain that large sections and low pressures are advantageous on loose ground. On harder ground the position may be reversed, a smaller tyre under higher pressure giving better performance. Clyde suggests that, in most circumstances, a pneumatic tyre grips by friction and that, consequently, the depth and nature of its tread pattern are unimportant. He makes the point that if the cohesion of the soil is so small that an ordinary rubber lug can penetrate, then its contribution to adhesion cannot be very great. He couples this, however, with the suggestion that, if any sort of tread pattern is ever advantageous, then it must be advisable in practice to select one that is deeply cut, because such would be less quickly worn smooth.

The development of general-purpose tractors in the United States over the last twenty years is discussed by Yerkes (Ref. 16). Such tractors are becoming increasingly important in this country, although they are rarely used with the special implements and attachments for which they are designed. In Great

Britain, in fact, a general-purpose tractor generally means one which is adapted to the special purpose of row-crop cultivation, but which is used with rear-attached implements only. A review of the available equipment of this kind is given by Newman (Ref. 1*g*), in a paper which also includes a number of practical hints based on experience in the field. In a second paper (Ref. 17) the same writer deals with the smaller motor cultivators used in horticulture, and discusses the various means adopted by makers for overcoming the steerage difficulties which are encountered in any two-wheeled, motor-driven device.

III.—CULTIVATING IMPLEMENTS.

During the last eight or ten years economic difficulties and the increasing use of the tractor have, between them, tended to introduce changes into the traditional routine of cultivation. None of these changes has been very spectacular and, with only one major exception, none of them has involved the use of any essentially new implement. But tractor users have found themselves in command of power sufficient to pull combinations of implements that are impracticable for horses, while horse users—faced with an even greater need to reduce costs—have found it essential to simplify procedure : to eliminate some operations and short-circuit others. One result of these changes has been to focus new attention on the physical problems underlying cultivation, in an attempt to distinguish between that which is strictly necessary and that which was possibly no more than the artistry of an earlier and more fortunately situated generation. Several papers dealing with work of this sort have appeared during the last year. Keen (Ref. 18), in illustration of the kind of problem which is being studied, outlines two sets of experiments conducted over a number of years at Rothamsted. The one has been designed to compare intensive inter-cultivation of row crops with cultivation only just sufficient to keep down weeds ; the other sought to determine whether, with deep-rooting crops, subsoiling is or is not advantageous. Full details of the row-crop experiments have been given elsewhere (Ref. 19), and it is sufficient here to remark that neither set of experiments disclosed any advantage for the particular cultivation studied. Keen suggests that the general conclusion to be drawn from such experiments is " that cultivations in excess of those needed to allow the weather to act, and to keep down weeds, are in general a waste of time and money." Now in one sense this conclusion begs the whole question for, as the author himself has often pointed out, the main object of all cultivation is to allow the weather to act. But the implied conclusion is clear enough : namely, that farmers in general—and good farmers in particular—are inclined to do more work on their soil than is necessary, and certainly more than will be repaid at harvest time. Before discussing this conclusion further, it will be convenient to refer to another paper on the same general lines by Sanders (Ref. 20). This opens by drawing attention to the lack of exact information of any kind about the scientific aspects of cultivation, and goes on to describe some work on the subject which is being carried out at Cambridge.

In plan this work takes the familiar form of randomized block experiments comparing different mechanical treatments of the soil. The object, however, is not so much to show that one treatment is better than another as to find out something about the physical differences in the cultivated soil which lead to a particular result. With this wider object in view, each set of experiments is engaging the attention of a number of different workers. For example, Nicholson's work on drainage, which has been referred to in the last two numbers of the *Farmer's Guide*, represented one aspect of the work—that of the soil scientist. In the paper now under discussion, Sanders deals with the experiments from the point of view of crop husbandry; while in two papers which will be referred to later the angle of approach is what may be called that of soil mechanics. So far three series of experiments have been undertaken. In the first, the comparison was between ploughing and cultivating as alternative preparations for a wheat crop on land from which potatoes had been lifted. In the second, gyrotilling as a preliminary cultivation for sugar beet is being compared with ordinary subsoiling. The third series deals with the spring cultivation of autumn-sown wheat, and compares the results from rolling, harrowing, and the two operations combined with the results obtained when no spring cultivations at all are done. Sanders is very insistent that, whatever operations may be compared and whatever immediate differences may be observed, the final appeal must be to the actual yields and that these must be examined on strictly statistical lines. Unfortunately, when regarded in this way, the results of the experiments so far carried out have been almost entirely negative. Only in one year out of four was there any difference between the results from ploughing and cultivating respectively as preparations for wheat. No differences in yield were found in four gyrotiller experiments with different crops, although other measurements disclosed marked differences in soil structure. Finally, out of eight completed experiments on the different spring cultivations of autumn-sown wheat, only one—and that a rather special case—indicated that the cultivations had any beneficial effect on the crop. If, therefore, one were to draw a general conclusion, it would be of much the same kind as that suggested by Keen; the experiments suggest that it is a matter of indifference whether potato land be ploughed or whether it be cultivated before wheat is planted; that no ultimate benefit follows a considerable expenditure of power on gyrotilling; and that spring cultivation of autumn-sown wheat is rarely worth while.

Yet another instance of the failure of rigidly controlled experiments to disclose differences which might have been expected from general experience is provided by the studies of surface consolidation that have been made at Wye. These experiments arose in the first instance from an observation that, in the case of a tractor-worked barley seed-bed in 1931, superior growth appeared to exist in the wheel-tracks of the tractor. Statistical examination of random strips, both on and between the wheel-tracks, showed that there was indeed a considerably increased yield in the wheel-tracks. But as Davies and Smyth-Homewood observe (Ref. 21) experiments on formal lines laid out subsequently to test the effect of consolidation failed to disclose any significant difference. It is concluded, in regard to the effect produced accidentally in 1931, that some cause other than simple consolidation must have been operative. Meanwhile, according to a later note (Ref. 22) a similar state of affairs has been found to exist in a barley crop during the present season (1936). Photographs of plants selected at random, from the tractor wheel-tracks and from the spaces between them respectively, show clearly that, in early June, the former were some 7 inches higher than the latter.

The experiments dealt with above have two features in common: they were all carried out on formal statistical lines, and they all failed to give positive results; nor can one easily call to mind a modern experiment on cultivations which *has* given a positive result—except perhaps in one isolated season. Are, then, farmers in general to conclude that all the care they have been accustomed to give their crops—with rolls, harrows, and so on—does no good at all in the long run? Or are they to conclude that there is something wrong with the experimental procedure—that it is too rigid for the study of something which must, in the nature of things, be varied from day to day in the light of the conditions actually prevailing? This point of view was admirably put forward by Amos during the discussion at the meeting at which Sanders' paper (Ref. 20) was read, but it provoked in reply only the suggestion that formal experiments should be made even more complex.

Quite apart, however, from the question whether modern experimental technique is as powerful a weapon as its users claim, it can be argued that it is wrong to make too much use of it in our present state of ignorance. A given series of cultivations—regarded not simply as something which one does with implements, but as a complex of interactions between implement, soil and weather—may turn out to be good, bad or indifferent. What we really want at present is information of any kind about good cultivations, and the contrast between the good and the bad ones, whereas modern technique is almost bound to encounter only the indifferent. No one can really doubt that good cultivations, producing definitely beneficial effects on the crop, do occur from time to time ; indeed, every arable farmer can quote odd instances from his own experience ; but they cannot be demonstrated in a formal experiment, except by sheer good luck, for their " goodness " must depend on day-to-day variations in soil and weather. Experimenters may try to allow for these variations by making their experiments more complex, but an experiment of almost unimaginable complexity would be needed to cover all the various things that a good farmer might conceivably decide to do to a single field between seed time and harvest. Nor are bad cultivations, which might at any rate provide a contrast, likely to find their way into randomized experiments because the latter are not, in fact, as completely randomized as they might be. For example, in a really randomized experiment, one ought to choose a range of possible sowing dates, draw one out of a hat, and sow the field on the lucky day regardless of the fact that, possibly, it has rained for forty-eight hours and is still pouring. But, in the actual event, this kind of thing is never done. And so, when our urgent need is for information of almost any kind, we actually get one negative result after another. Surely, in the circumstances, experimenters should aim at contrast rather than at mathematical accuracy—for one chance bumper crop, considered and digested in the light of all that has happened to it, would be worth an infinite number of insignificant differences.

A further aspect of the Cambridge cultivation research—physical measurements of the state of disruption of the soil—is dealt with in two papers by Culpin (Ref. 23). The first paper deals with the means adopted for measuring compactness and consolidation respectively. Compactness, or overall soil density, was measured by firing standard revolver bullets into the soil and measuring their depth of penetration. Consolidation, on the other hand, was measured by means of a specially designed " penetrometer " which records a load-penetration diagram as a small probe is slowly pushed into the soil. In the second paper the use of these devices, in exploring the differences between the soil conditions on gyrotilled and horse-cultivated plots respectively, is discussed. Both methods showed, especially on heavy land, that large differences persisted between the plots for some time after the cultivations had been done. After approximately a year, however, the revolver bullets no longer disclosed any differences in compactness, although penetrometer differences were apparent, in certain cases, for as long as nineteen months. These penetrometer differences are said to be due to planes of weakness which persist after the initial looseness of gyrotilled land has settled down, and which were most noticeable at depths from 6 to 12 inches below the surface. The measurements were related both to sieving tests (which showed that even twenty months after being gyrotilled the soil on the plots so treated contained a lesser proportion of large particles) and to tests of plough draught, which showed that the gyrotilled land offered a decreased resistance to a plough. The results of the sieving tests would appear to be at variance with Keen's results, which were quoted in the last number of the *Farmer's Guide.* In regard to the other differences it should be remembered that the gyrotiller uses roughly 16 h.p. per foot of working width, while the horse-drawn implements with which it was compared presumably used two or three horses (the exact number is not stated) for rather less than a foot. Differences are therefore to be expected and, in the circumstances, a formula connecting the greater expenditure on gyrotilling in the first place with the reduced expenditure on subsequent ploughings might be interesting.

A very comprehensive general review of problems of soil dynamics—in the course of some seven pages it deals with over 300 references—has been given by Schmitz (Ref. 24). In it he makes the rather surprising statement that, thanks to the large number of methods of determining mechanical properties, cultivating implements can be constructed and their working parts shaped without the experience of actual practice. It is doubtful whether implement manufacturers will agree with this. However, every one will agree wholeheartedly with the author's plea for greater co-operation between soil scientists and agricultural engineers. A more practical paper on the application of engineering principles to implement design has been written by Clyde (Ref. 25). He describes methods for measuring the forces actually acting on the implements when at work, and for analysing them into useful and "parasitic" forces. In a second paper (Ref. 26) he describes the application of his methods to some existing implements, notably ploughs and disc cultivators. Some of the results are striking, especially those relating to the manner in which the forces on a plough may be changed by the addition of a rolling (or disc) coulter.

On the farming side of cultivation there may be mentioned a bulletin by Rayns and the present writer (Ref. 27) on the methods practised by sugar-beet growers on the Continent, and a paper by Deal (Ref. 28) dealing with modern ridge cultivation as practised in the United States. The interest of the former, in the present connection, lies in the fact that it describes a number of seed-bed implements which are unfamiliar to farmers in this country and which, judged by their working in the field, were highly successful in their respective districts. In several instances, however, the principles underlying the implements appeared to be quite at variance with modern theories on such subjects as capillarity and moisture control. The new American form of ridge cultivation, which also applies particularly to sugar beet, is in some ways reminiscent of Jethro Tull. The land is thrown up in autumn into 40-inch ridges and in spring two rows of sugar beet, 14 inches apart, are sown on each ridge. Subsequent cultivation consists of ploughing between the beds and hoeing on the ridges. The advantages are said to be an earlier seed-bed in the spring and, subsequently, better root development of the plants.

IV.—Harvesting.

According to Bridges and Whitby (Ref. 5) there were thirty-eight combine harvesters at work in England during 1934 and three more at work in Scotland. These figures exclude four machines employed by a Lincolnshire contractor, nor do they include a number of others lent by implement firms for demonstration purposes. The total of about fifty machines is rather less than might have been predicted in a forecast made, say, in 1932. It is also remarkable that no fewer than six machines owned by British farmers were not used during 1934. The apparent check in the progress of the combine was probably due mainly to the fact that, as was well known, certain machines more suited to British conditions were being developed at the time and hence there was a tendency on the part of the farmer to delay purchase. On the other hand, the fact that six machines, which presumably had been bought and paid for, stood idle in a season which was favourable for their use is an indication that combining is not an ideal solution for everyone. The purpose of Bridges' and Whitby's paper, however, was not to discuss such general questions but to give an account of the working of the twenty-two combine harvesters employed on the nineteen farms which have been mentioned earlier. The paper gives, in rather concentrated form, the most complete account of combining in this country that has yet appeared—including particulars of land, cropping, costs both of equipment and working, and a host of details concerning the different methods followed. Between them the twenty-two machines harvested nearly 6,000 acres, an average of some 270 acres each ; the largest acreage cut by one machine was 380 acres. The crops consisted mainly of wheat and barley, but small acreages of oats, peas and other crops were included. The average rates of working for different farms varied from 7 to 18 acres per day and from 0·8 to 2·0 acres per hour. The overall averages, with crops averaging nearly 4½ quarters, were

13·8 acres per day and 1·6 acres per hour. Complete harvesting costs are given for eight of the farms. No average costs are calculated, but the following may be taken as a rough guide :—combining, 2*s*. 6*d*. per quarter; trucking, 6*d*.; drying and dressing, 1*s*. 2*d*.; making a total of 4*s*. 2*d*. per quarter. In regard to methods of working it is noted that only four farms dispensed entirely with binders. Some farms used binders only for opening-up the fields but on the majority binders were, for reasons which are discussed in the paper, employed to cut about a quarter of the total crop. With only one exception each farm possessed its own drying equipment. The cost of this varied considerably—from £125 to £676—the average being £416.

Since one of the arguments against the combine is that it wastes a potentially valuable by-product, a full discussion of the methods of dealing with the straw on these farms would have been of interest. But in 1934 the price of wheat straw was so low that there was little inducement for combine users to collect more than was necessary for their own use. Consequently, on nearly three-quarters of the acreage, the straw was burnt. Some farms gathered a portion of the straw by means of hay sweeps and elevators, while in two cases straw was baled (at an estimated all-in cost of about 10*s*. per ton) and sold profitably.

The working of a combine harvester on two adjoining farms in East Lothian is the subject of a paper by Walker (Ref. 29). The machine cut 291 acres at an average rate of 17½ acres per day and dealt with crops yielding up to 7½ quarters per acre. The author concludes that, although it may yet be premature to gauge the possibility of using the combine on a large scale in Eastern Scotland, there is no doubt whatever that its adoption in this particular instance has amply justified itself.

Practically all the combines referred to in the above papers are standard 10- or 12-foot machines resembling in all respects, save only in the width of their cutter bars, the machines used in the large grain-growing countries. With straw still generally regarded as a valuable commodity, machines of this type have appeared at a disadvantage from the point of view of the general run of farmers in this country. With our relatively heavy and long-strawed crops, the choice has been between leaving a very long stubble or slowing down the rate of cutting almost to the point where the combine becomes uneconomic. Its size and first cost have also reacted against this type of machine except in those relatively few districts where large farms and large fields are the rule. Considerable interest, therefore, is being taken in the smaller machines which have been developed recently, especially since another of their features is their ability to handle relatively bulky crops. The two machines of this kind which made their first appearance here during the 1935 harvest are discussed by Newman (Ref. 1*h*). The more successful was an American machine with a 5-foot cutter bar. It has a number of novel features which make it specially suitable for work in England although it was not specially designed for English conditions. Among these features may be mentioned that it has a rubber-faced beater-type drum of the full width of the cutter bar and situated parallel to, and immediately behind it; that all its various mechanisms are driven by Vee-belts running over adjustable sheave pulleys; that it is mounted on pneumatic tyres; and that it can be driven and hauled by a fairly small tractor. Only two of these machines were used in England in 1935, but one of them cut 300 acres of light crops in 200 working hours without causing trouble of any kind, and left no more stubble than a binder. The second was delivered late in the season and, in consequence, cut only 60 acres; but it worked just as satisfactorily as the first and dealt with exceptionally heavy crops. The other machine mentioned by Newman was of German design and was specially constructed to leave unbroken straw. It included many novel features, having, in fact, few features in common with the ordinary types; but since its manufacture has been discontinued it is not worth describing more fully here. In fairness to its manufacturers, it must be mentioned that its very unusual mechanisms were able to achieve what their designers had claimed, but many of them were vulnerable, and stoppages were rather too frequent. Another model by the same firm is working this (1936) harvest and this, although quite different from the first, is just as unconventional. Full particulars are not available at the time of writing, but it is understood that the machine both threshes and bags the grain and binds the straw.

Some performance studies of small combines in the United States during 1935 are recorded by Hurst and Humphries (Ref. 30). The trials are of no very great interest to British readers since, although reference to more ordinary crops are included, the writers are mainly interested in the harvesting of soya beans. It is interesting, however, to quote the statement that "a two-plough tractor (*i.e.* one of 10–12 drawbar h.p.) in good mechanical condition seems to have no difficulty in operating a power take-off combine with a cutter-bar width of about 5 feet at ground speeds up to 5 m.p.h."

Finally, there must be mentioned a paper by Williamson (Ref. 1*j*), which examines the possibilities of saving harvest labour without the use of combines. This is the only paper of its kind to appear during the year under review, and, it must be stated frankly, it fails to make out a very good case for any departure from ordinary harvesting methods other than combine harvesting. This is, of course, no fault of the author; the paper mentions several interesting possibilities but none of them seems to have any great practical application. On the other hand, the paper does include reference to a number of minor points in connection with ordinary harvesting which, if not strictly labour-saving in the sense that the combine is, are worth noting as leading to a more trouble-free harvest.

Both combine harvesting and the alternative harvesting methods that have been proposed lead directly to the question of grain storage. The grain drier which was regarded, in the first instance, simply as the necessary adjunct to the combine in our uncertain climate, has proved its usefulness beyond all question; indeed, it seems that in most cases, even if the combine were to fall into disuse, the drier would survive. Many combine farms have, however, more or less neglected the storage question, with the result that the greater part of the combined grain has been marketed immediately after harvest. For a number of years on end this has not mattered much one way or the other, but in 1935 early marketing resulted in quite considerable financial losses because prices rose later. Two papers on this subject by Denham and Murray respectively (Ref. 1*k*) are therefore of particular interest at the moment. The one deals mainly with the type of storage equipment which is suitable for medium-sized farms but pleads also for the establishment of national granaries. It also stresses the advantages to the farmer of possessing adequate cleaning and grading appliances. The companion paper is devoted solely to general economic considerations, and attempts to determine whether, in the long run, the money spent on farm storage facilities is likely to be repaid by higher average prices. In the case of wheat it would seem that there is a definite case to be made out for storage: prices tend to rise late in the season, the more so in a wet year than in a dry one. In the case of barley, on the other hand, immediate marketing is not likely to lead to any great loss, and it is doubtful whether capital invested in storage equipment would give an adequate return.

V.—GRASS CONSERVATION.

During the last year or two the question of grass conservation has assumed great prominence, mainly because of the very rapid development of appliances for drying grass artificially. The whole subject has been reviewed in an Agricultural Research Council report (Ref. 31) which estimates that through conserving grass by the relatively inefficient method of ordinary haymaking, our farmers lose about five-and-a-half million pounds annually. As the report points out the loss can, in some cases, be reduced by baling hay direct from the field; or better still by making silage. But neither method is very certain in operation and silage making, in particular, involves a number of practical difficulties. By comparison with both these methods artificial drying would appear to have considerable advantages. The report estimates that, in general, the raw material for a ton of dried grass could be produced for less than 40*s.* and that, at the prices current in September, 1935, the value as feeding stuff of a ton of the dried material would be about £6 10*s.* From the latter figure and a consideration of probable yield, it is deduced that a satisfactory system for drying young grass would about double the value of the output from our grasslands. The report goes on to deal in general terms with the problems underlying grass drying and suggests several directions in which research or trial is needed. Because of the scarcity of commercially operated plants at the time of writing, however, it gives very little information about the actual practice of drying. Most of the preliminary ground covered by the A.R.C. report—and in particular the question of relative feeding value of grass preserved in the various possible ways—is dealt with in greater detail by Page (Ref. 1*l*), who gives an enormous amount of information on the research side of the subject. His paper, most of which is rather outside the scope of this article, was read at the Oxford Conference mentioned earlier and was followed by an account of practical grass-drying experiences by Higgs (Ref. 1*m*) who dealt with the working, during its first season, of a partly experimental tray drier of a type that is now being produced commercially. About 200 tons of dried grass were made at a working cost which was estimated at about £3 2*s.* per ton. Actual drying, exclusive of depreciation and interest, came to £1 17*s.* 6*d.* Higgs' main difficulty was that all his grass came away at once in early summer, so that it was impossible to deal with it with the rather small drier then available. He considers that it should be possible to avoid this trouble in future by properly controlled manuring. His paper speaks very highly of the product as food for dairy cows—in fact he proposes in the future to instal two larger plants and so to avoid haymaking altogether. It should be mentioned that his farms extend to 700 acres and carry about 300 head of pedigree Ayrshires. A review of the equipment used both for the collection and the drying of short grass is given in another article (Ref. 32). The whole process is developing so rapidly, however, that although all the papers referred to above contain much useful information, none of them is very up to date at the time of writing this article.

The only commercial driers referred to, for example, are considerably more expensive to buy than some of the ones that are now coming into use. Again a full season's experience with a number of plants has shown that there are rather more difficulties than were originally expected. These difficulties are concerned not so much with the technical side of drying as with the business of fitting the process into the general farm routine. Even with the lower-priced outfits now being developed, the capital cost of the equipment is high. The output, on the other hand, is low: most plants do not turn out more than about 3 cwt. of dried grass per hour. The plant has therefore to be worked at high pressure for as long as grass is available, and the practice of working day and night shifts from mid-April to the end of October is not uncommon. Again, the process involves quite a lot of labour in one way or another, part of which at least must be more or less skilled. Since, from the point of view of the quality of the product, the start of the season is the most important time, the difficulties which will arise from dispersing the labour force in October and re-assembling a new gang in April are obvious. Alternatively, quite considerable changes in routine must be made if the surplus men are to be profitably employed during the off-season. The present (1936) season has shown, too, that there are difficulties in connection with the grass itself. Drying costs are much the same whatever the quality of the product and, owing to the effects of a sudden wet spell following an unusually dry one, quite a lot of the material which has been produced this year, with a final value of £6 to £7 per ton in mind, is actually worth no more than exceptionally good hay. Taking these points together, it may be said that while the process has so far proved successful when applied on specialist lines to the production of a feeding stuff for sale externally or, what amounts to much the same thing, for sale by one branch to another of a really large farm, it has not yet developed sufficiently to be of real and proved benefit to grassland farmers generally. On several farms the attempt is being made to fit the process in, in not too specialized fashion; but how far the results are really economical is not yet known. What is wanted would seem to be a plant with considerably increased output which, being worked intermittently as circumstances dictate, could produce about the same total quantity in the season as is now being produced by continuous high-pressure working. It must not cost too much nor involve too much labour: on the whole a difficult problem, but one which it will be well worth while to solve.

An interesting example of the use of existing equipment for grass drying is provided by two trials in 1933 and 1934 at Wye College (Ref. 33). Spring grass was dried in a hop oast, using ordinary farm appliances for collection. The material was spread in a layer about a foot deep on the floor of the steam-heated kilns and was dried sufficiently in about eight hours. The overall cost of cutting, collecting and drying was estimated at about £4 10*s*. per ton and comparative feeding trials with sheep showed that the product was rather better than the ration of oats and cottonseed meal against which it was tried.

On the future generally of grass conservation, it is obvious that a great deal will depend on the management of the grassland itself. Stapledon (1*n*) discusses some of the questions involved and although his paper is concerned mainly with grass strains and mixtures, he makes many incidental references to grassland implements. Where indifferent pastures are concerned, the author is obviously in favour of drastic measures, and considers that rotary cultivators may be found useful. The improvement of pasture land by mechanical treatment is also discussed by Bates (Ref. 1*o*). After dealing with ordinary methods of "mat" eradication, he refers to a study which he has made of the development of a fine leafy herbage on footpaths. Controlled experiments indicate that this automatic and local improvement of what is often very poor pasture is due neither to straightforward treading nor to manurial effects. It appears rather to be due to a combination of treading and rubbing—the latter action being produced by the turning of the feet in contact with the ground. Bates goes on to describe an india-rubber-faced harrow, made up of baulks and motor tyres which, used when the land is wet, can be shown to give similar results.

VI.—ELECTRICITY.

A conference on the use of electricity in agriculture was held at Rothamsted in January of this year, and in the published proceedings (Ref. 34) are to be found both the papers and a report of the discussion which followed. Harvey (Ref. 34*a*) begins by discussing general questions connected with obtaining and using a public supply. The many farmers who, having to dodge grid poles on their farms in one operation after another, and who wonder why, in the circumstances, they cannot readily obtain a supply of electricity, will find the difficulty more or less clearly explained here. On the other hand, the explanations which appear in this paper, as in every other on the same subject, of the reasons why standing charges and similar tariff difficulties exist, will probably not be found very convincing. From the point of view of the supply companies the matter is clear enough, but farmers in general are not likely to be interested in the companies' difficulties. Nor will the ingenious analogies, which Harvey presents, do very much to clear up what is, after all, a very real grievance. The hypothetical difficulties which would confront a farmer whose customer, having regularly bought 50 gallons of milk daily, nevertheless wanted 200 gallons on one particular day are really beside the point. Every farmer knows that if he runs an oil engine or a tractor the nearest distributor will bring him just the amount of oil or paraffin he wants on whatever day he may require it, and will charge a standard price per gallon. In the long run electric supply companies must sell their goods in the same way, or rest content with a very small share of the agricultural power market.

Harvey goes on to review the various uses to which electricity may be put in farming. This section of the paper contains quite a lot of useful information but most of it is submerged under a mass of detail obviously dragged in so that every imaginable application of electricity may be referred to. There are references, for example, to soldering irons, grain sprouters, hair curlers, and overhead irrigation outfits. At the end of the paper some working costs of actual electrical installations are given, but no comparisons with the costs of alternative methods are included. Such comparisons are always difficult to make since the farmers concerned have rarely kept any sort of record of their pre-electricity costs of barnyard power. Indeed, it can be counted as one of the advantages of electricity that accurate costings are very easily carried out. Finally the paper gives some very useful data sheets on the power requirements of different agricultural operations. In the same series of papers Rowland (Ref. 34*b*) gives a very adequate account of the various types of farm motors that are now available, and discusses their relative advantages for different purposes. Cameron Brown (Ref. 34*c*) discusses farm wiring with special reference to the possible dangers from earth leakage. Farm wiring is a matter which most farmers have to take on trust and there is room for authoritative warnings regarding the points which they should study before accepting a wiring contract. There appear to be some differences of opinion as to whether it is proper to discuss earth leakage in public lest an impression should be left that electricity is a potentially dangerous form of power. However, every form of power has some possible danger attached to it, and it is obviously right to call attention to whatever safety devices are available.

In the last of the papers read at the conference—and the only one dealing directly with the results of research—Cashen and Keen (Ref. 34*d*) discuss comparisons made at Rothamsted between electric motors and internal combustion engines as a source of barnyard power.

In one series of experiments a 20-h.p. electric motor was compared with a small tractor as a means of driving a threshing machine. Actually two different tractors were used, one practically new and one that had done about 7,000 hours of general farm work; and one of the most interesting points brought out by the results is that the older tractor used slightly less fuel than the new one. With electricity at 1·42*d*. per kWh.—the average price for that particular quarter on the Rothamsted farm—the running costs of the motor were slightly higher than those of the tractor. But lower overhead charges in the case of the electric motor more than offset the difference in running costs, and its overall cost proved to be appreciably lower than that of the tractor. How far this particular comparison can be taken to have proved anything is rather doubtful. No one, presumably, would buy a tractor specially for threshing unless, of course, it was also going to be used to pull the machine from place to place. One can go further and say that the use of a tractor for any kind of belt work must always be uneconomic in the sense that, if fairly costed, it is bound to be more expensive to run than a stationary power unit of appropriate size. In practice such machines are never fairly costed, and when the authors of this paper defend the use of a tractor for relatively light belt work on the grounds that the farmer is only "wasting" the difference in fuel consumption (between a tractor and a smaller engine) they are overlooking depreciation altogether.

In the second series of experiments a smaller motor was compared with a diesel engine, of comparable power, as a source of power for grinding. Here again the engine cost appreciably less in fuel and oil than the motor did in electricity and, on the basis of 500 hours of work per annum, the engine was still the cheaper proposition, but by a much smaller margin, when overheads were taken into account. An increasing annual working period would, however, ultimately reverse this result. It is very difficult to make such comparisons convincing, especially when the advantage of one or the other depends on an assumed life of 20–25 years for parts of the equipment. Things change so rapidly nowadays that it is unreasonable to expect anyone to look further than seven or ten years ahead.

Among other papers on electrical topics there may be mentioned yet another American study of electric heating for propagating benches, by Tavernetti (Ref. 35) and a paper on soil sterilization by Blauser (Ref. 36). The first of these gives the results of a fairly complete set of heating experiments in the form of conveniently arranged charts. In the other it is shown that with electrical methods more certain sterilization can be effected in a shorter time than if steam is used.

A paper by Getchell (Ref. 37) discusses the possibilities of electric pasteurization of milk. He claims that such defects of pasteurization as spoiled flavour and lowered food value are mainly due to the fact that milk is a poor conductor of heat so that, in raising a bulk to the required temperature, some of the milk is overheated. It is not clear what type of pasteurizing plant Getchell has in mind in making this claim, and it is very doubtful whether his arguments would apply at all to modern large-scale plants. However, the alternative put forward of pasteurizing by passing an electric current through the milk itself is worth noticing, especially as it appears that two trial plants have given remarkably good results.

VII.—MISCELLANEOUS.

From 1924 to 1932 a number of mole draining demonstrations were arranged by the Ministry of Agriculture and direct information about the process was thus given to farmers. Also in most cases regular reports on the subsequent history of the various fields were made by county officials. These reports have now been summarized by Blackaby (Ref. 38) in a note which provides a good deal of information, particularly in regard to the life of the drains. The note mentions that the results of the work done at these demonstrations were not wholly satisfactory but points out that this was no doubt due to the fact that the need for exhibiting as much as possible to the public, on the appointed day, had sometimes to be allowed to override other considerations. Also, the farmers whose land was drained did not always finish off the work properly. For instance, where the demonstration, as was generally the case, stopped short after drawing the mole drains and digging a trench for a tile main, the laying of pipes in the latter and the connection with a properly cleaned-out ditch was sometimes indifferently done. In the case of drains emptying direct into ditches, the point most often neglected was the outlet. As Blackaby points out, a single length of ordinary tile at the outlet is not sufficient : there should be a 2- or 3-foot length of glazed pipe or boiler tube. Other causes of deterioration were the passage over shallow drains of dung carts and similar vehicles : damage by moles and other rodents : and, particularly in the last year or two, the opening of the slits in very dry weather. Notwithstanding all these possible defects the figures given at the end of the note indicate that the life of small-diameter drains, drawn with tractors, ought to reach ten years, and that, where an appreciably shorter life was recorded, there was nearly always an obvious defect which might have been avoided.

In May of last year an unusually late and severe frost did an enormous amount of damage to orchards in this country and made methods of orchard heating of sudden interest to fruit growers. Hoare (Ref. 39) gives a brief account of some of the methods that are practised and a more detailed account of a method based on the use of liquid fuel. A minimum of fifty burners to the acre is required, and with this number the temperature can be raised by as much as 7 or 8°F. If necessary a frost alarm system can also be installed, thus obviating the necessity for keeping a look-out man permanently employed on night work.

An addition to the already heavy burden of odd knowledge that a present-day farmer is compelled to carry is provided by the growing importance of refrigeration. Refrigeration in the dairy has already become common, mainly as a result of a sequence of hot summers : its application to farm storage generally is less widespread but, particularly where fruit or table poultry is produced, is increasing steadily. Whether it is really necessary for the farmer to know anything much about the inner working of his plant is doubtful in these days of semi-automatic self-contained units. But, as Cameron Brown points out in an introduction to a booklet on the subject (Ref. 40), it is at least desirable that he should be sufficiently familiar with the appropriate technical expressions to be able to deal with the sales propaganda that any enquiry, however tentative, will bring to his door. The booklet explains the working of refrigerating plants in general terms and explains the considerations which govern their use on farms. It also gives information about costs, both of equipment and of working. Gas storage of fruit is also dealt with.

A paper by MacDowall and Long (Ref. 41) on chemical methods of weed destruction may be regarded as summarizing several papers on the subject which have been mentioned in this article in earlier years. The many different chemicals that have been used, and the various weeds that have been dealt with, are reviewed. The three chief chemicals are copper sulphate, sulphuric acid (which is rapidly replacing it) and calcium cyanamide ; while the arch-enemy among the weeds is charlock. The use of other chemicals for combating perennial weeds is also discussed, but it appears that no such process is at all widely used. The latter part of the paper deals with equipment for applying both wet sprays and dusts and gives much practical information about their use.

Finally there may be mentioned a paper on a subject which, although often overlooked, is of importance to every farmer : farm transport. Warburton (Ref. 1*p*) points out that the haulage on a mixed farm of medium size must amount to over 1,200 ton-miles per year. Since for the most part this haulage has to be done over fields or rough tracks, and consists of short journeys over which much valuable time can be wasted, attention to efficiency of transport is likely to be well worth while. The paper gives a number of test figures relating to the draught of different kinds of vehicle. Leaving aside field railways, which are out of the question on most farms, the most efficient equipment for haulage under bad conditions is provided by track-laying trailers hauled by track-laying tractors. But where these involve too much expense, low-pressure pneumatic tyres will increase pay loads considerably, and make haulage very much easier, in all but the worst conditions. Warburton gives a number of instances drawn from his own experience and ranging from haulage with bullock teams in Africa, to beet haulage in the Fens and grain haulage on a mechanized farm.

S. J. Wright.

Institute for Research in Agricultural Engineering,
University of Oxford.

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FARM ECONOMICS.

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In pre-War days, and for some ten years or more after the War, the farmer's concern with economics centred almost entirely in his own farm management. He worked upon a settled system adapted to the capacity of his land, and the economic problems which he had to consider were those of making the most efficient use of the capital and labour at his command for the production of crops and stock.

To-day, these problems still confront him, but in the space of a few years he has been called upon, besides, to take a prominent part in the discussion and reorganization not only of farm management but also of the far more intricate problem of national agricultural policy. Farm economics to-day extends far beyond the bounds of the farmer's fields, and it includes the consideration of questions such as the balancing of his claims for markets for his products against those of the manufacturers for export; the claims of the Empire producers for a share in the home market; the relation of home agricultural production to public health; the association of land settlement with unemployment relief; the problem of overproduction, so-called, and the limitation of output. These are all of them economic questions of an importance to the farmer equal to those arising in daily farm management, and it is necessary that he should keep himself informed upon them if farming is to hold its proper place in the industrial structure of the State. Agriculturists to-day must be political economists as well as efficient farm managers, and so the first section of this record of farm economic research in 1935 deals with investigations made to provide data upon which to base national agricultural policy.

I.—AGRICULTURAL POLICY.

1. *Agricultural Protection.*

The spread of economic nationalism in all countries led the Economic Committee of the League of Nations, in July, 1934, to make "a study of the consequences in industrial countries of increased agricultural protectionism and the effects of this policy in countries engaged mainly in agriculture." Moreover, in the course of the discussions of the Assembly of the League of Nations in September, 1934, "stress was laid on the extent to which the demand of agricultural countries for industrial goods is limited by their inability to sell their products in industrial countries which have increased their agricultural protection."

The Committee presented its report in 1935. It is based upon a note by Sir Frederick Leith Ross, in which he attempts to determine, with the help of statistics, the extent to which excessively rigorous agricultural protectionism is responsible for the collapse of international trade. He divides his consideration of the subject into two periods, the years prior to 1929 and those since 1929, the latter of which he calls the most critical phase in the development of European protectionist policy since the War. He points out that as world prices fell so European customs barriers rose, this being the means by which each country attempted to shield its farming industry from depression. Wheat and other cereal crops were the commodities most affected by the depression, the price of Canadian wheat in London and Liverpool falling from an average of 48*s.* 6*d.* per quarter in 1929 to 23*s.* 7*d.* per quarter in 1931. It will be of interest to quote Sir Frederick Leith Ross's investigation of the measures taken in certain European countries to meet this situation.

In Germany, duties on wheat were changed six times during the year 1930, the total result being to raise the price to an equivalent of 12*s.* 6*d.* per cwt., or about 1½ times the English price of Canadian wheat in 1930. In October, 1934, the duty was again heavily increased. In France, the duty was more than doubled between May, 1929, and May, 1930, bringing the equivalent price of wheat to 6*s.* 8*d.* per cwt., and in July, 1931, the duty was doubled again. The Italian duty was also increased at various dates between May, 1929, and August, 1931, the last figure being equivalent to a tariff of 150 per cent. *ad valorem* at the time of its imposition.

Tariffs were not the only form of protection adopted. In many countries import duties were supplemented by measures requiring the milling industry to use a specified percentage of home-grown grain in the manufacture of flour. Milling quotas of this sort were first imposed by Germany in 1929, but they are now in operation also in France, Italy, Sweden, Belgium, Holland, Czecho-Slovakia and Greece.

Turning, now, to meat, Sir Frederick points out that most of the fall in prices has occurred since 1930, so that the adoption of extreme protectionist measures has been more recent than with wheat. After February, 1933, the duty on fresh, chilled and frozen meat imported into Germany was itself equivalent to 1½ times the price of Argentine chilled beef in London at that time, and import regulations now exist which virtually prohibit the entry of frozen meat. In France, import duties on meat were unchanged until 1933, but since May of that year heavy taxes have been imposed. In October, 1931, regulation of imports by quota was adopted, and after April, 1934, quotas were allotted for mutton only, so that the import of other meat was prohibited. In Italy, duties had been increased by 400 per cent. in September, 1932, and since January of that year a regulation was in force providing that at least 85 per cent. of the output of the municipal slaughter houses had to be derived from home-fed animals. Belgium went off free trade in meat in November, 1931, and after May, 1932, imports of meat and cattle were controlled by licence.

Other results of Sir Frederick's investigation concern the duties imposed and regulations made to protect the dairying industry in various countries. It is interesting to note that these have taken the form in some countries not only of tariffs and quotas for imports of butter, etc., but also for oils and fats which compete with butter through their use in the manufacture of margarine. In Italy, this competition was felt by the native olive growers as well as by dairy farmers, but Germany and France have also adopted measures to regulate the trade in margarine.

After reviewing the statistical position of the European imports of foodstuffs in a series of tables, Sir Frederick summarizes the results of his study of agricultural protection. His concluding paragraph deserves the widest consideration :—

> "The present world crisis is the composite result of many different causes; but one of the measures which would indubitably promote world recovery would be the gradual relaxation of the present intensive agrarian protectionism of the industrial countries of Europe and its replacement by a system comparable with that which prevailed before the War. No time, however, must be lost; each year that

> passes creates vested interests which become more and more difficult to uproot and drives more deeply into the economic structure of the world the tendencies summarized above. It is surely in the interests of all countries to promote as rapidly as possible a more economic system of production and interchange of commodities between the industrial and the agricultural countries."

The whole of this Report would repay reading by every farmer. It is short, and, although every statement is documented by reference to official statistics, it is free from those technicalities and the use of jargon which sometimes make economic writing very difficult for the general reader (Ref. 1).

From the foregoing summary of protective measures for agriculture in European countries generally, it is interesting to turn to a study of the assistance given to farming in this country. Events have marched so rapidly since the nation abandoned the policy of leaving agriculture to take its chance, which held the field from the repeal of the Corn Laws in 1846 until the enactment of the Import Duties Act in 1932, that few people, probably, are aware of all that has been done for agricultural protection and assistance. The results of a comprehensive and detailed investigation of the various forms and values of this assistance were the subject of the presidential address delivered by Dr. J. A. Venn to the agriculture section of the British Association for the Advancement of Science. This investigation was directed towards the enumeration of the various reliefs and disbursements granted by the State, and to the assessment of their total cost. It included the wheat deficiency payments, the sugar beet subsidy, the beef subsidy, the milk grants and the local taxation reliefs, all of which affected farmers directly. Further, it was extended to include the expenditure on small holdings and allotments and afforestation, and the cost of the Ministry of Agriculture, of the Department of Agriculture for Scotland, and of the educational, research and other services financed by the Development Commission. At the same time some assessment was made of the augmented prices due to the import duties and restriction of imports, while on the other side of the national agricultural balance sheet Dr. Venn set the additional labour cost imposed upon the farmer by the orders of the Agricultural Wages Board.

While farmers may feel that some part of the expenditure included in the results of Dr. Venn's research has benefited them only indirectly, as, for example, the cost of agricultural scholarships, or even not at all, as in the grants to the Forestry Commission and for Land Settlement, his summary of his work is a very valuable review of the financial results to the rural community, as a whole, of the new national policy for agriculture, and it should be of great interest to farmers. The total of his account may surprise them, when they look at their own accounts or at their pass-book balances, but if the agricultural situation to-day be contrasted with what it was, say, six years ago, Dr. Venn's figures will be more readily appreciated (Ref. 2).

2. *Agriculture and National Health.*

During the year under review, the problem of nutrition in relation to national agriculture sprang into considerable prominence. As a result of scientific research on the nutritional value of foodstuffs since the discovery of vitamins by Sir F. Gowland Hopkins, the importance of certain foods in human dietary has been clearly established. These foods are what are generally described as the fresh foods, such as milk and milk products, eggs, fruit and vegetables, as distinct from the cereals, sugar and the infinite variety of preserved foods which form so large a part of the diet of the people of to-day. Research workers in the subject have urged that more abundant supplies of these commodities should be made available at prices within reach of all, and more recently it has been suggested that national policy for agricultural development in this country should be directed towards the same end. In other words, the proposal is that the State should concentrate more on the encouragement of the production and the consumption of perishable foodstuffs, leaving the producers of the others, many of which are cheaply produced abroad and easily transported, to take their chance in the world market.

This problem of nutrition has occupied the attention of the League of Nations, which appointed a Mixed Committee, under the chairmanship of Lord Astor, to consider it, and it has issued an interim report (Ref. 3). In this it states that it has received overwhelming evidence that there is ample scope, even in Western Europe and in the United States of America, for a great increase in the consumption of many forms of food, while in the world as a whole there is need for the increased consumption of all foods. This evidence is fully supported by a report published by the International Labour Office (Ref. 4), so that there can be no doubt that the real interests of nations demand, not a restriction of agricultural production, but the discovery of means by which the real needs of each community for the healthgiving foods may be correlated to the undoubted power of agriculture to produce all that is necessary for abundant health.

The Report of the League of Nations Mixed Committee suggests that governments should survey the national food consumption and compare it with the levels of consumption which science has demonstrated to be necessary for health, while considering how far the national agriculture can be relied upon to make up the deficiencies at reasonable cost, and how far it would suit the general national economy to rely upon importation. The committee foresees, in this way, a gradual reorientation of the agriculture of the industrial countries. With the growth of demand for the protective foods, so-called, farmers will produce more milk, more vegetables, more fruit, more eggs, and will be less concerned over the prices of wheat and sugar.

The whole question was investigated from another angle by the Staff of the Rowett Institute, Aberdeen, in co-operation with the Staff of the Market Supply Committee. A report on the investigation was published by Sir J. B. Orr, Director of the Rowett Institute (Ref. 5), and the conclusion arrived at is that "a diet completely adequate for health, according to modern standards, is reached at an income level above that of 50 per cent. of the population." The average diet of the poorest group, comprising four-and-a-half million people, is, by the standard adopted, deficient in every constituent examined. That of the second group, comprising nine million people, is adequate in protein, fat and carbohydrates, but deficient in all the vitamins and minerals considered. That of the third group, comprising another nine million, is deficient in several of the important vitamins and minerals.

For the purpose of this review of farm economics, the question is, how is all this going to affect the farmer, and what is he to do about it? Sir John Orr gave some answer to it himself when he met the members of the Farmers' Club (Ref. 6). He suggested that a national food policy, in the interests both of agriculture and of health, would develop agriculture along the lines of increasing foodstuffs of special health value, namely, animal products, fruit and vegetables. At the same time he acquiesced in the subsidies for wheat and sugar beet, and, as a good Scotsman, though perhaps somewhat irrelevantly, he urged that all the argument put forward for a subsidy on wheat could be applied with equal force to oats. In the main, however, the suggestion of the paper was that so long as a large part of the population cannot afford to buy the health foods which they need, production and consumption should be subsidized by the State so as to bring milk, eggs, fruit and vegetables in much greater quantities within reach of all.

The wisdom of a policy to link national health with agricultural development seems clearly established, but the implications of it, when the time comes to translate it into practice, will want much more consideration than they have had so far. Moreover, they may conflict with the policy of those who insist upon the importance of home agriculture as a line of national defence.

3. *Land Settlement and Unemployment.*

Another problem in agricultural policy which received a good deal of study during the year arose from the advocacy, in certain quarters, of land settlement as a means of relief for industrial unemployment. In some parts of the country, in South Wales and on Tyneside particularly, unemployment was such that the hope of reabsorption of large numbers of men in their former avocations had been abandoned, and their removal from an industrial to a rural environment was proposed. The possibilities of any large scale migration of this kind were investigated by C. S. Orwin and W. F. Darke. In the publication which contained the results of their work (Ref. 7), they traced the experience of all cultivators since 1913, showing the steady decline in the number of holdings not exceeding twenty acres, notwithstanding the activity during that time of the County Councils, operating under the Small Holdings and Allotments Acts and the Land Settlement (Facilities) Act, 1919, passed to provide small holdings for ex-service men. Everywhere the tendency had been towards the consolidation of small farms into larger ones, and the experiences of the small market gardeners and fruit growers hardly supported the view that they were branches of the agricultural industry for which the industrial unemployed might be particularly suited. Moreover, the cost of land settlement and the rate at which men could be settled were shown to be obstacles to any effective action in this direction for the relief of unemployment.

Confirmation of this investigation was forthcoming later in the year in the Report on Land Settlement prepared for the Carnegie United Kingdom Trustees by A. W. Menzies Kitchin (Ref. 8). It includes the particular consideration of all the branches of agriculture suitable to small-scale operation, and rules them out, one by one, as offering no real opportunity to the men whom the Carnegie Trustees wished to help. Its final conclusion was that it is through the physical and moral advantages of regular occupation on a half-acre plot of ground, cultivated mainly for self-supply by men in receipt of unemployment assistance, that something could be done to link the land with the industrial problem, rather than through attempts to turn coalminers and shipwrights into commercial farmers.

II.—FARM MANAGEMENT.

1. *Costs of Production.*

From America comes a pamphlet on the determination of farming costs, by J. A. Hopkins and P. A. Taylor. The writers state that interest in costs has been expressed by various groups in the United States for the past forty years, the source of the demand for "cost of production" prices being dependent upon the direction of current price movements. With rising markets, consumers have demanded that prices of foods should be kept down to something approaching the cost of producing them. On the other hand, when the markets were falling, farmers have often demanded that prices should be kept up to the level of costs.

After the War, the study of farm costs was undertaken by a large number of States, it being thought that the Government might continue price-fixing in some arbitrary manner. However, the interests of the farmers in this work evaporated with the rise in prices in 1922 and the following years. But the authors are unrepentant advocates of costing on the farm, on the grounds that a correct understanding of the nature of costs and of their relationship to the value of products, is the foundation of practical farm management.

This publication is concerned, first, with a discussion of methods. They distinguish three general methods, that of estimation, the survey method, and the use of detailed accountancy. Estimation, which is not based on actual records, they say, has no validity, and reputable economists are chary of making use of it. The survey method, on the other hand, is based on data supplied by farmers in answer to carefully drawn-up schedules. The authors recognize its advantages as being less expensive than detailed records, so that a larger sample is secured, and in considerably less time. On the other hand, they point out that it assumes the accuracy of the farmer's memory, or at least that the errors made in one direction by some will be equalled by those made in another direction by others. On this assumption, their view is that there may be at least an equal tendency for errors to run always in the same direction. In short, they say, and most people who have studied the question will agree with them, that detailed accountancy is the most dependable method of costing. Where opinions about it may diverge is on the question of whether the results are worth the cost, which the authors put at about 5,000 to 6,000 dollars (£1,000) for a staff of one head man, his travelling expenses and his clerical assistants, capable of dealing with twenty-five farms. This figure, about £40 a farm, may be something of a challenge to some of those engaged in farm costing in England.

The next section of the pamphlet is a discussion of the principles of costing—whether rent should be included (they say not); how to value the farmer's capital and his services as manager; how to charge family labour; how to value farm products consumed on the farm (*query*, cost of production or market price? They say cost of production); the division of a composite cost between the main product and the by-products; all these questions are the hardy perennials of discussion whenever British farm economists confer on problems of farm costing.

The pamphlet concludes with a discussion of the uses of costs of production and the relationship of cost to price. In this connection the authors' discussion of marginal cost is of particular interest. They define the marginal producer as being the highest cost producer whom it is necessary to keep in business in order to supply a given demand. Thus, they say that if the demand for hogs were to fall to fifty millions per year, the marginal producer would be a pretty efficient farmer, producing pigs under pretty favourable conditions. If, however, the demand rose to sixty millions, the marginal producer could then be a less efficient farmer, or one less favourably placed for pig production. This discussion and its implications might well be considered by milk producers in this country to-day. Production of a greater quantity than the liquid market can absorb is placing the marginal cost lower, month by month, and it would eliminate more and more of the less efficient, or of those less favourably placed for milk production, if the milk market were uncontrolled (Ref. 9).

On the same subject, and more accessible to British readers, is a paper by J. Wyllie, read before the Farmers' Club. He was not concerned to argue the methods of farm costing, but he confined himself to a statement of the value to the farmer of this means for the study of farm management to promote better organization, the reduction of costs and to increase efficiency. The author clearly regards cost determination as something for the guidance of the individual rather than for the much more intricate and controversial purpose of price fixing (Ref. 10).

2. *Economic Surveys.*

(*a*) *Scotland.* Two somewhat belated reports, the fifth and sixth of a series on the profitableness of farming in Scotland, covering the years 1932–3 and 1933–4 respectively, have been produced. For the first of these years accounts were available from 146 farms, and the number rose to 176 in the following year. They are classified in four geographical areas, the North Eastern, the South Eastern, the Border and the South Western.

Taken together, the reports reflect in general the experiences, also, of farmers during these years south of the Border. Everywhere dairy farming occupied the most favourable position among all the types of farming examined. In the North East the improvement had set in before the advent of the marketing schemes, but the cheese producers and the milk sellers in the important dairying district of the South West benefited in the second year from the organization of the Scottish Milk Marketing Scheme. The cattle breeders and feeders of the North

East suffered throughout both years from the continued decline in cattle prices. The heavy losses recorded by the Border flockmasters, however, in the earlier year, were reduced with the improvement in the prices of sheep and wool in the next period, and further improvement was foreshadowed. In the Eastern area, subsidy payments under the Wheat Act were of considerable value, and in the face of unsatisfactory results from the important potato crop, they did much to help farmers in the second year.

Summarizing the position in Scotland, the improved returns in the year 1933–4 are attributed largely to the development of agricultural policy through the Wheat Act, the marketing schemes and measures for dealing with imports (Refs 11 and 12).

(*b*) *East Anglia.*—During the three years 1931–33, the Farm Economics Branch of the Cambridge University Department of Agriculture carried out a series of economic surveys covering about 1,000 farms in some of the Eastern Counties of England. In 1935, the same district was re-surveyed to provide data for a study of the changes in the economic organization of agriculture in the interval, during which the new national policy had been launched.

The results are based on an identical sample of 220 farms in the two years 1933 and 1935. They are related to districts classified as Central Norfolk, North Essex, South Essex and South Cambridgeshire, and it will be noted that the Holland division of Lincolnshire, the most important agricultural district of the Eastern Counties, or indeed, of England, is not included. The average profit in 1935 in all districts differed little from that of 1933. There was an improvement in Central Norfolk and in South Essex; the clay lands of North Essex showed no change, and only on the light chalk lands of South Cambridgeshire was the position actually worse. But the sources of income and the composition of expenditure showed great changes. Over the whole area, income increased by 14 per cent., while expenditure rose by 17½ per cent. There were larger receipts from pigs, cattle, milk, sheep, hay, potatoes and oats, while the rise in costs was due mainly to larger expenditure on feeding stuffs, store stock, labour, fertilizers and seeds. The increases on both sides of the account were due more to increases in quantities of produce sold and materials and labour bought than to changes in unit prices, so that there must have been a tendency towards intensification of production. The author of the Report, R. McG. Carslaw, points out that the larger output has been secured without a corresponding increase in employment, so that the output per man has risen with the output per acre. He also finds reasons for concluding that the live stock output has increased disproportionately to the increased food consumption, indicating greater efficiency, also, in live stock management (Ref. 13).

(*c*) *Devon and Cornwall.*—Farmers in the extreme south-west of England may be interested in a Report on the financial results of a group of 106 farms in Devon and Cornwall for the year 1933–34. It is the third of a series issued by the Department of Economics at the Seale Hayne Agricultural College. The writer of the Report, W. H. Long, emphasizes the smallness of the sample of which his figures are composed, and it must be hoped that the general experience of farmers in the two counties has been better than that of those included in his survey. The farms are divided into eight geographical groups, from North Devon to West Cornwall, and in half of them no profits have been made in any of the three years recorded. Three of the other groups incurred losses until 1933–34, and one group only, that of farms west of Truro, showed profits in each of the three years. It may be remarked, however, that even in the unsuccessful groups the results were less bad in the last year (Ref. 14).

Another Report from the Seale Hayne College deals with the changes in the systems of farm management on South Devon farms in recent years, based on a comparison of conditions in 1928 and in 1934. The district is essentially a dairying one, and it has responded to the Milk Marketing Scheme, though not so much as might have been expected. Of 109 farms selling no liquid milk in 1928, thirty-two had adopted this practice by the end of 1934, and it seems that the establishment of a factory at Totnes was the principal factor in the change from farmhouse butter-making to liquid sale. But the effect of the Milk Scheme on farmhouse butter makers has been less than is often supposed. During the first fifteen months after its start, less than one-third of the butter and cream makers had entered the liquid milk market, and there was no sign of any rapid increase in the numbers in the early part of 1935. "Farm butter-making in South Devon," says the author of the Report, "is by no means dead, and a large potential source of milk remains untapped in this area." What is more noteworthy than the change from butter-making to milk selling in South Devon is the change from butter-making to cream. Cream sales have nearly doubled during the period under review, the explanation being, no doubt, that cream prices have been better maintained than butter prices (Ref. 15).

3. *Crops.*

(*a*) *Power farming.*—The introduction of the Harvester-Thresher a few years ago has led to the organization of a number of large mechanized grain-growing farms, while a number of established farmers in the grain-growing districts of England have added this implement to their equipment. At first sight, the advantages which its use might confer, given an area under corn sufficient to provide it with full scope, seem obvious. Harvesting and threshing are performed in one operation, the labour of stooking, carting, stacking, thatching and pulling the stack to pieces again, is all of it cut out, and with the installation of a drying plant as the complement of the machine, the farmer is practically independent of the weather at the time of harvest. But there are other sides to the question. The first combine-harvesters were designed to deal with the light crops of the prairies, and the heavy English crops were apt to choke the drum, a difficulty which was accentuated if the machine were set to leave only a short stubble. The straw leaves the drum in a condition only fit for litter. The time saved on operations subsequent to harvesting is not a real gain to the farmer unless other productive work can be found for his men. The problem of grain storage arises, unless the farmer is to be at the mercy of the market immediately after the harvest.

To examine these problems, therefore, a study was begun in 1934, at the Agricultural Economics Research Institute, Oxford, of a group of farms situated mainly in the Eastern and Southern counties, on which the Harvester-Thresher was employed. So far as is known, every farmer owning one was visited, to the number of twenty-eight, and complete costs were kept throughout the harvest of that year on eight farms, while records were taken of the organization for production with its aid, on all of them. The work was repeated in 1935, and it is to be continued in 1936. In this way the Institute expects to accumulate a body of evidence, both statistical and general, for the information of those who are considering an investment of capital in the Combine. In the meantime, A. Bridges and H. Whitby, the investigators responsible for the work, have issued a preliminary report covering the period to the end of 1934. It discusses the cost of capital equipment, both tractors, combines and grain dryers; it discusses the labour organization, the rate of harvesting, the cost of combining, transporting the corn from the field, and the drying and dressing costs. Omitting one farm on which the acreage of corn was small, the total costs for all operations varied from 19*s*. 8*d*. per acre and 4*s*. 9*d*. per quarter, to 14*s*. 4*d*. per acre and 3*s*. 2*d*. per quarter. Further Reports are to be issued, to include the experience in the next and subsequent years (Ref. 16).

As a supplement to this Report, there is included a study, by J. R. Lee, of the cost of tractor work on the farm. The study is based on a computation of tractor costs at the Agricultural Economics Research Institute during the fourteen years 1919–33, and the Report deals with the cost of maintenance, the hours worked, the rate of working, and the costs per acre for performing various operations by tractor draught. The problem of labour organization is also discussed in connection with the greater speed at which tractor operations are performed, and there is a comparison of the costs of tractor work and horse work on certain farms where tractors and horses are both in use (Ref. 16).

(*b*) *Arable farming in the East of Scotland.*—Arable and semi-arable farms in the Lothians, East Fife, East Perthshire and Angus were again the subject of investigation by D. Witney and his assistants at the Edinburgh and East of Scotland College of Agriculture. The financial accounts of the farms form the basis of the study, and while the results show an improvement over those of the previous year, the average profits on the arable farms being something more than £1 an acre, and those on the semi-arable farms about 12*s*., the authors of the Report say that neither of the groups could have made ends meet without the help afforded by the Wheat Quota and by the Cattle Subsidy (Ref. 17).

4. *Live Stock.*

(*a*) *Dairy farming in the Blackmore Vale.*—This is the Fourth Annual Report on the financial results of a group of dairy farms in Dorset. The thirteen farms included in it are all grassland farms, mainly dependent upon milk sales, with poultry and pigs as considerable side lines (Ref. 18).

(*b*) *Border Sheep farming.*—From another Report by the Edinburgh and East of Scotland College, Border Sheep farming does not seem to have recovered completely from the low prices of five years ago. The number of those farms showing profit, however, bears a greater proportion to the whole, both for low ground and high ground farms (Ref. 19).

(*c*) *Sheep breeding and feeding at Wye College.*—The cost records kept for many years on the College farm at Wye have been published from time to time to give the experience of the farm manager in the different branches of the farm. College farms suffer from obvious disabilities regarded as commercial ventures, but J. Wyllie's figures are carefully analyzed, and the circumstances of sheep breeding and feeding at the College are so fully described that the Report should be of some general interest to farmers in East Kent (Ref. 20).

(*d*) *Pig Husbandry.*—A Report of particular interest to pig breeders and feeders was issued by W. T. Price and A. W. Ling, the Agricultural Organizer for Wiltshire and the Agricultural Officer for the University of Bristol respectively. It has special reference to an investigation conducted by them in south-west England on behalf of the Bath and West Society. The inquiry covers eighty-one farms, ranging from a small holding of one acre to a farm of 3,000 acres. Sixty-five of them were mixed farms including pigs, seven were specialist pig farms, and nine were dairy farms with pigs as a side-line.

Pigs of almost every breed and cross were found, but, amongst the pure breeds, the Large White predominated and boars of this breed were most favoured for crossing. The most popular cross was the Large White boar and the Saddleback sow, with the Large White × Large Black as a good second. The investigators found that the Pigs Marketing Scheme is inducing farmers, quite definitely, to go for type, irrespective of breed.

Special attention was paid to methods of housing. Indoor farrowing was favoured everywhere except in Wiltshire and Hampshire, and the general custom was to house the young pigs until they were put up for fattening, instead of letting them run out. The buildings in use ranged from houses specially constructed for the purpose, to old railway carriages and dog kennels. Fattening was pursued in all sorts of buildings also, but the Danish type of special fattening house was gaining ground. Attention is drawn to the inadequate lighting and ventilation of many of the houses, and the investigators quote a farm in Devon where one end of the fattening shed consisted entirely of panes of glass. The pigs in this pen invariably reached bacon weight many days before similar pigs in the pens further from the light.

The Report contains a full discussion of all the details of housing, floors, light, ventilation, heating, etc., and their influence on pig production. Feeding rations were carefully studied, both for dry sows, sows with litters and for the pigs after weaning. Ailments and their treatment are also dealt with. The Report concludes with the investigators' recommendations to pig breeders and feeders, based on the observations and experiences of their inquiry, and some notes on the problems which call for further research. Altogether it is a valuable piece of work, which should be widely read (Ref. 21).

(*e*) *Poultry.*—Problems of egg and poultry production are of first-class importance now that the industry has assumed such proportions. Appended to the Wiltshire Report on Pig Husbandry is a first Report on experiments on poultry feeding by H. F. Burdett, showing how the cost of feeding can be reduced if greater advantage be taken of good grass herbage to replace part of the expensive protein element in the mash fed to laying hens. The work had proceeded only for one year when the Report was produced, and the author rightly desires to repeat his experiments. However, they have shown beyond question that hens having no added protein consume a great deal of grass, while those receiving a high-protein ration eat practically none. Further, that the health of the birds on the low-protein diet was much higher than that of the others, as shown by a mortality rate of 14 per cent. against one of 26 per cent. Egg production by the low-protein birds was as good as that of the others except during the summer months, when the birds showed a greater predisposition to broodiness and excessive moulting. Mr. Burdett suggests that this might be overcome by increasing the protein ration during this season (Ref. 21).

From the other side of the south of England comes a Report on the financial problems of poultry keeping, being a study by J. Wyllie of poultry costs in Kent, Surrey and Sussex. He records the expenditure under the headings, foodstuffs, labour, equipment and sundries, on fourteen farms over a period of years, and as might be expected, the results show wide variations. He concludes, however, that the price level either of foodstuffs or of eggs is not the most important factor in success or failure, and it is the efficiency of the farmer and his success in escaping the ravages of disease that are the dominating factors (Ref. 22).

These conclusions are confirmed very largely by two other financial studies of poultry farming, one by C. V. Dawe and S. R. Wragg, which is a continuation of work begun in the previous year in the west of England (Ref. 23), the other by a team of workers drawn from the Harper Adams Agricultural College, Salop, and the Armstrong College, Newcastle-on-Tyne (Ref. 24).

III.—MARKETING, PRICES AND SUPPLIES.

1. *Marketing.*

(*a*) *Agricultural Co-operation.*—Agriculture has travelled a long way since the days immediately after the War, when a great effort was made, backed by Government and private finance, to organize the distribution of its requisites and products by voluntary co-operation. Had this effort succeeded, the course of agricultural planning to-day might have been different. Voluntary co-operation must always be associated with the honoured name of Horace Plunkett, and it is appropriate that the Foundation bearing it, which he endowed, should have set itself to consider the relation of voluntary association to State control. In almost every country, the Government has now stepped in to control or to subsidize agriculture. In Great Britain, at all events, the new policy has at least a democratic basis, and it may be that the Marketing Boards are the modern interpretation of the co-operator's ideal. The Horace Plunkett Foundation has made a survey of the whole position, both past and present, which provides a short and readable summary of the new organization of agriculture, together with an assessment of its effects on the different classes of the rural community, on consumers and on overseas producers. While, as would be expected, the Foundation feels some misgivings for the future of the marketing schemes, claiming that by stabilizing prices and the partial elimination of competition, they may reduce the efficiency of farming. At the same time, they have stereotyped or even raised the costs of the secondary process of distribution, and it is quite clear that the Foundation sees little hope for an early return to the principle of voluntary association (Ref. 25).

(*b*) *Eggs and Poultry.*—The Reorganization Commission for Eggs and Poultry, Great Britain, reported just before the close of the year. In a preliminary survey of supplies and prices, it draws attention to the higher prices commanded by home produce, a difference due to quality, and it considers that further control of imports would do more to expand the home industry than to raise prices. Briefly, the Commission is emphatic in the view that market reorganization at home holds out much greater possibilities of profit than import restriction, and that any assistance which might be needed could be given better in the form of an import duty. In fact, higher duties on foreign eggs are recommended, together with the removal of Empire countries from the free list and the taxing of their produce, though at a lower rate than for foreigners. Twenty-five per cent. of the revenue thus collected should be earmarked, it suggests, for the assistance of the home industry. But the Commission states very plainly that the recommendations on import policy are intended to supplement and to assist the reorganization of marketing of home produce, not to make it unnecessary (Ref. 26).

(*c*) *Vegetable Marketing.*—A new publication in the Economic Series issued by the Ministry of Agriculture deals with the marketing of vegetables in England and Wales, but its survey covers also some important aspects of the supply of overseas produce for the home market. It reveals a highly complex industry, carried on as to production partly by specialists concentrated in well-defined districts where soil and climate are specially favourable, and partly by mixed farmers growing a field or two of the vegetables in common demand. Processing, storage and transport are described, and there is an account of the application of the National Mark Scheme to vegetables. This dates only from 1933, but already practically the whole range of fresh vegetables in commercial production are included in it, and surely there can be no branch of the agricultural industry which stands more in need of the standardization of grades, packs and packages than this one. The Report concludes with an account of wholesale and retail distribution, including grower-retailing in the larger towns, direct sales through the post, and roadside marketing.

The vegetable industry is one of extraordinary complexity. There seems to be a growing tendency to leave the production of the commoner vegetables more and more to the mixed farmers, while the market-garden specialists concentrate on luxury and semi-luxury products. Amongst the market-gardeners, however, conditions vary widely, from the small-holder with two or three acres on which he works as hard as any labourer, to the highly intensive capitalist organization on 100 acres or more. To reorganize the methods of distribution on any uniform plan would be a gigantic task. In the meantime, however, the consumer may be forgiven if he cannot understand why plums may drop from the trees, and green vegetables may be ploughed in, while he is unable to satisfy his wants (Ref. 27).

(*d*) *Wool.*—The Imperial Economic Committee has produced an analysis of the consumption and trade in wool and wool products in Empire and foreign countries since 1928. Such a review presents many difficulties, for reliable estimates of the consumption of wool in individual countries are almost completely lacking, and such statistics of trade and production as are available are not uniform. The aim of the Intelligence Branch of the Committee in preparing this volume has been to assemble as clearly as possible such data as are available.

The period covered by the review has seen many and striking changes in the wool textile industry, more particularly in the volume and direction of international trade. Severe economic depression, unemployment, restricted production, and currency fluctuations have caused material modifications in the wool consuming industries. However, the statistical position of wool remains healthy, and in 1934 and 1935 the end-of-season stocks in the four principal producing countries was only 8 per cent. of the total production, and the 1935–36 clips are being rapidly absorbed. As British flockmasters are aware, this position is reflected in the prices of wool, and for those of them who are interested in world trade in this commodity, this publication will provide much useful information (Ref. 28).

2. *Prices and Supplies.*

(*a*) *Milk.*—There are few things, probably, of more importance to farmers at the present time than the future of milk marketing. For a long time, dairy farmers in certain localities enjoyed a virtual monopoly of the market for milk for liquid consumption, because of their accessibility to it. But great technical progress has been made since the War, both through the organization of milk collection from the farm by motor lorries for rapid transit to consuming centres, and through the application of cooling and pasteurizing processes which increase the keeping qualities of milk. As a result, large dairying districts which had no outlet for their milk, even a few years ago, except in the form of butter or cheese, were brought within reach of the big liquid milk markets. Indeed, it would not be too much to say that to-day the old local monopoly has gone, and there is no part of the country which is not able to produce milk for liquid consumption in any other part. At the same time, the import of manufactured milk products has been going steadily upwards, with the result that prices have been going down.

Now, collective bargaining by producers and distributors before the Milk Marketing Scheme, kept up the price of liquid milk, and the policy of the Milk Marketing Board since the adoption of the Scheme has been the same. Thus, the consumption of liquid milk has not expanded, and the pooling principle upon which the Board works, has led to declining farm prices, in proportion as the growing surplus of home production has gone into manufacture and world prices for the manufactured products have fallen.

Those who are interested in the milk industry should read the study made by Ruth L. Cohen of the history of milk prices. Her investigations cover the pre-war period of unorganized buying and selling, the period of war-time control, the post-war period of the Permanent Joint Milk Committee, and finally the institution of the Milk Marketing Board. Historically, it is a complete and authoritative statement of the progress of the dairying industry in this country, and of the influence upon the milk market of the growth of imports. The principle upon which the Milk Marketing Board is working, namely the differential price, is held to have been necessary to save the liquid milk market from complete collapse. Indeed, the author suggests that price differentiation might be extended to consumers of liquid milk, with the object of increasing consumption amongst certain classes, on the lines of the Milk-in-Schools Scheme. At the same time, she points out that the action of the Board has without doubt raised prices to consumers, particularly in country districts and in the smaller towns, and thus has prevented any expansion of the demand. To-day, with high retail prices and falling farmers' prices, the position of the milk industry seems again to be approaching that from which the Milk Marketing Scheme rescued it, for the time being, three years ago. This book provides the data necessary for the consideration of the future of the milk industry (Ref. 29).

(*b*) *Potatoes.*—On this same question of the effect of prices on consumption, some valuable information is contributed in a short publication by the Potato Marketing Board, describing an experiment in the distribution of potatoes in a depressed area in County Durham. Like the dairy farmers, producers of potatoes were faced with the problem of the disposal of supplies in excess of the existing demand for direct human consumption, while the manufacturing channels available to them returned them only very low prices. Accordingly, the Potato Marketing Board decided to try an experiment in organizing the sale of potatoes from a central point, at a specially reduced price, to persons prepared to carry their purchases home. Readers must be referred to the Report for the details of the experiment. What emerges from it is that the idea commonly held that the demand for potatoes is inelastic, because at low levels of income consumption is already high, potatoes being used as a substitute for more expensive foods, is mistaken. The increase in consumption, while potatoes were on sale at the reduced price, was so much as 91 per cent. and this in a town having a high proportion of low-level incomes and at a time when potato prices were already exceptionally low. The speculation at once arises, as to how far the increased consumption of farm products which might result from reduced prices, would give higher average prices to farmers for commodities, like milk and potatoes, which have to be sold on a differential price scale. Alternatively, it becomes a matter for consideration whether future national policy for agriculture might not be developed in the direction of subsidizing consumption rather than production (Ref. 30).

IV.—General.

Two publications of general economic interest remain to be noticed. The third issue of *Farm and Machine*, emanating from the Institute for Research in Agricultural Engineering, comprises the papers read at the Agricultural Engineering Conference in January, 1936. The technical problems are dealt with in another section of this publication, but the problems of mechanization of the farm are largely economic, and farmers will find much that is helpful to them on questions such as the comparative advantages of horse and tractor labour, the scope of the Combine Harvester, the economics of grain storage, the new grass drying process, etc. In particular, the paper by W. S. Abbott may be mentioned. Here the farmer will find an account of the complete reorganization of a farm. Attention may be directed specially to the labour organization, by which each branch of production has its own special labour unit, and to the folding systems for pigs and poultry which have done much to reduce the cost of manuring (Ref. 31).

The other publication is the third annual volume of the *Agricultural Register*, which, as in previous years, contains a full summary of the agricultural legislation of the year and the progress of agricultural organization under the marketing schemes, regulation of imports and otherwise. It contains, further, a summary of supplies and prices of agricultural products and requisites, together with miscellaneous information on subjects such as agricultural wages, land settlement and agricultural credit. Scotland and Northern Ireland are included in the review, which provides a book of reference for farmers, politicians and the general reader on all current agricultural affairs (Ref. 32).

C. S. ORWIN.

Agricultural Economics Research Institute,
Oxford.

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DAIRY FARMING AND DAIRY WORK.

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I.—GENERAL NOTES.

Agriculture and Public Health.

IT has been the custom in recent issues of this section to refer briefly not only to specialized research work in dairy farming and dairying, but also to subjects of wider scope. This practice may well be continued in the present review because of the many indications that the importance of an ample supply of certain kinds of agricultural produce, to the health and well-being of the people as a whole, is being more fully recognized. Acknowledgment by medical and scientific authorities that certain home-produced foods are of special value in the diet of the people will be welcomed by all farmers. The dairy farmer, in particular, will appreciate the emphasis laid on the nutritive value of milk and on the need for a much greater consumption of milk in its liquid form; hence no apology need be made for beginning this annual review with a summary of recent pronouncements on the need for a closer relationship between agriculture and public health.

Valuable evidence on this subject has recently been published in a report on Food, Health and Income (Ref. 1) by Sir J. B. Orr. The report contains the results of an investigation into the average consumption of the main foodstuffs by different sections of the community, classified according to their respective average incomes. An examination of the composition of the diets of the six different groups shows that the degree of adequacy for health increases as income rises. The average diet of the poorest group, comprising 4½ million people is, when judged according to a standard of well-being, such that no improvement can be effected by substitution, it being deficient in every constituent examined. That of the second group, comprising 9 million people, is adequate in protein, fat and carbohydrates, but deficient in all the vitamins and minerals considered. That of the third group, comprising another 9 million, is deficient in several of the important vitamins and minerals. Complete adequacy is almost reached in the fourth group, while in the still wealth er groups the diet has a surplus of all the constituents considered. The report further states that the estimated average expenditure per head (including children) on food in each of the six groups is respectively—4*s*., 6*s*., 8*s*., 10*s*., 12*s*., and 14*s*. per week, with an average of 9*s*. The average estimated income, per head per week, is 30*s*.

To make the diet of the poorer groups the same as that of the fourth group (whose diet is adequate for full health) would involve increases in the consumption of a number of the more expensive foods, namely milk, eggs, butter, fruit, vegetables and meat, the necessary increase varying from 12 to 25 per cent. The amount of the desirable increases in milk and butter consumption respectively are 16 and 15 per cent. It is further stated that the average consumption of liquid milk for the whole population is 3·1 pints per head per week (slightly under half a pint per head daily) but that, in the lowest group, the average is only 1·1 pints per head per week, while in the highest it rises to 5·5 pints. In the lower groups there is a greater consumption of condensed and dried milk, yet when all kinds of milk are converted to an equivalent of liquid milk, the group consumptions per head per week are: Group I, 1·8 pints; II, 2·7 pints; III, 3·1 pints; IV, 3·6 pints; V and VI, 5 pints.

The significance of these results is more fully realized when it is explained that, in the lower income groups and especially in the lowest, there is a larger proportion of children than in the higher income groups. (It is estimated that between 20 and 25 per cent. of the children in the country are in the lowest income group and it is pointed out that the evils of a poor diet are accentuated in children.) Because of the needs for new tissue formation, children need a diet richer in first-class protein, in minerals, and probably also in vitamins, than do adults. The "newer knowledge of nutrition," with special reference to the quality of the proteins, and the realization of the importance of an adequate supply of certain mineral substances and vitamins, have led to the conclusion that much of the ill-health which afflicts human populations can be directly attributed to deficiencies in diet.

The problem of nutrition and national health has also been dealt with by other authorities, such as McCarrison in the Cantor Lectures, 1936 (Ref. 2), and the Health Committee of the League of Nations (Ref. 3). In his lectures McCarrison discussed the composition of food and its utilization in the body, and the effects of incomplete diets on body development and on resistance to disease. The view is expressed that certain foods, especially milk and leafy vegetables, well deserve the name of "protective foods" because they supply the high-quality proteins, the mineral matter and the vitamins which are frequently lacking in common diets. In the League of Nations report it is stated that "milk should form a conspicuous element of the diet of all ages," and attention is drawn to the "high nutritive value of skimmed and separated milk, which, although deprived of its vitamin A through removal of the fat, retains the protein, the B and C vitamins, the calcium and other mineral elements."

The Nutritive Value of Milk.

An important memorandum on the Nutritive Value of Milk (Ref. 4) was issued recently by an Advisory Committee on Nutrition, appointed by the Minister of Health and the Secretary of State for Scotland. This memorandum, though containing nothing which was not previously known to students of nutrition, summarizes conclusions regarding milk which are well worth quoting and which should prove invaluable in stimulating an increased demand for milk. It is stated that milk alone is the food "which contains all the materials essential for growth and maintenance of life in a form ready for utilization by the body. . . . It contains the energy-giving nutrients, protein, fat and carbohydrates; all the known essential vitamins; calcium, phosphorus, iron, sulphur, iodine, magnesium, potassium, sodium, chlorine and copper, some of the physiological roles of which are known; and a number of other elements, present only in minute amounts, such as manganese, zinc and fluorine, the exact functions of which are not fully understood, but which would seem to be as necessary for normal nutrition as any of the other constituents."

The dairy farmer or milk distributor may have difficulty in realizing that the above description applies to the milk which he produces or sells. Were such a fluid a new discovery, placed on the market in an attractive form and with the assistance of persuasive publicity, it would doubtless command a high price. Instead, it is available in large quantities, brought to our doorstep at least twice daily and offered at a price below that of other beverages of lower nutritive and protective value and, like many other common, useful foods, is often neglected and certainly not appreciated at its true value.

The memorandum goes on to state that "within recent years much experimental evidence has been brought forward, which has shown that cow's milk is the most valuable food known for the promotion of growth and health in children . . . The present consumption of liquid milk is somewhere in the region of 0·4 pint per head per day on the average . . . There can be little doubt from the experimental evidence obtained that an increase in the average consumption of milk to about 1 pint per head per day would result in the improvement of the general health of the community, especially in the case of children, in whom it would secure better bone formation and improvement in stature and physique. It would diminish the incidence of disease, including rickets, and increase resistance to dental caries." The amount of milk recommended for children is one to two pints daily, and for adults a minimum of 0·5 pint daily is desirable.

The effects of heat on the nutritive value of milk are also briefly discussed. It is stated that the few human experiments that have been done have not shown that heat significantly lowers the food value of milk for man. The heating of milk, moreover, has important advantages in rendering it safe for consumption. "The ideal is milk from perfectly healthy cows, but herds in which all cows are perfectly healthy are at present relatively few. Where such milk is not available, the milk should be pasteurized or boiled before use."

The conclusions and extracts given in the preceding paragraphs make it abundantly clear that the produce of the dairy farm can and should play a most important part in raising the health standard of the nation. The milk producer will be even more interested in the practical application of the conclusions. This subject was dealt with by Sir J. B. Orr and others at the Farmers' Club (Ref. 5). Emphasis was laid on the need for a greater consumption of the "protective foods"—milk, eggs, fruit and vegetables—and it was also stressed that, if the desirable increase in consumption is to be brought about, these foodstuffs must be made available to the poorer sections of the community at a price lower than the present retail price. At the same time the costs of production (particularly in respect of the milk most suitable for human consumption) are such that no lower prices can be accepted without lowering the nutritive and hygienic qualities of the produce. Three possible solutions to this problem were suggested: (*a*) a rise in unemployment benefit and in the wages of the poorest paid workers; (*b*) a saving in the cost of distribution, and (*c*) a subsidy from the National Treasury. The first possible solution would not have the desired results unless a considerable proportion of the extra income were spent on the foods of special value. Expenditure in this direcion will only be made when parents have a better realization of food values and of suitable diets. McCarrison (Ref. 2) points out that both the medical and scholastic professions are in a position greatly to aid the endeavours of the Government in the building of an " A.1 " nation, and stresses the importance of the education of the young in the principles of wise selection and use of foods. " It is only by the instruction of youth that the faulty food habits of the people can ultimately be altered and the desire created for those things that be good from the nutritional point of view."

Turning to the second possible solution, the possibilities in this direction have, at least in respect of milk, been emphasized by numerous Commissions which have studied the production and distribution of milk. The latest pronouncement on this subject has been made by the Committee which investigated the complaints about the operation of the Milk Marketing Scheme (Ref. 6). It is the view of this Committee that: " There is room for general increased efficiency in distribution so as to enable this very necessary service to the public to be given at less cost," and " Until there is increased efficiency in distribution and an improvement in the price of manufacturing milk, there is little hope of the price of liquid milk being sufficiently reduced to bring about a substantial increase in consumption."

The third possible solution—that of a Government subsidy—has not, so far, found many supporters. Sir John Orr suggests that such a subsidy would be used to bridge the gulf between the wholesale price needed to make farming remunerative and a retail price which would be within the reach of all consumers. He points out that, in the past, strong objections were raised to the expenditure of public money on sanitation, on drains and water supplies and on housing, but the measures and improvements which such expenditure has rendered possible have greatly lessened the incidence of epidemic diseases from which we used to suffer and has helped to extend materially the average length of life. " To-day what is needed is an extension of that policy to food. We can buy health, and we can buy a prosperous agriculture which will make the food supply of this country safe in peace or war " (Ref. 5). He goes on to suggest that part of the subsidy could come from a tariff on imported foodstuffs—which part would probably be sufficient to satisfy the farmer—and that the other part, obtained from the Treasury, would be public health expenditure. He adds that we are already subsidizing food for the poor in the form of cheap milk to school children, free meals and relief of destitution.

The development of a policy and of schemes to give effect, either wholly or partly, to the views set out above must necessarily take time, but the subject is of such fundamental importance, and affects such a large proportion of the community, that progress must be made. The comment by the Council of Agriculture on this matter is as follows. The Council " has noted with interest the discussions which have taken place in recent months on the question of nutrition and its bearing on agricultural policy. It may be early yet to look for practical results, as it necessarily takes time first to accumulate accurate knowledge on nutritional questions and then to elaborate plans and schemes for using it of which the nation will approve, but the Council welcomes the attention which is being directed to this subject and considers that discussions on these lines are likely to be valuable both to the nation and to home agriculture " (Ref. 7).

The Milk Marketing Scheme.

The second complete year of the Milk Marketing Scheme (which became operative in October, 1933) was completed on the 31st March, 1936, and a report was issued to all registered producers (Ref. 8).

This report contains, of course, the first comparisons with the results of the previous twelve months, and is of great interest to all milk producers. It is shown that the total quantity of milk passing through the Board increased from fully 912 million gallons to fully 991 million gallons—an increase of 8·6 per cent. This milk was utilized mainly for direct consumption, but the total amount so used showed little increase over the previous year. The actual quantities were fully 650 million gallons in 1934–35 and about 657 million gallons in 1935–36—an increase of only 1 per cent. The remainder was utilized for the manufacture of produce ; the quantities so used were fully 262 million gallons in 1934–35 and fully 334 million gallons in 1935–36—an increase of 27·5 per cent. Another way of expressing this distribution is to say that in 1934–35 the liquid milk market absorbed 71·3 per cent. of the total, leaving 28·7 per cent. to be made into produce, whereas in 1935–36 the respective proportions were 66·3 per cent. and 33·7 per cent.

The failure to increase materially the quantity of milk absorbed by the liquid milk market, and the consequent marked increase in the quantity used for manufacturing, are of the utmost significance to the future of the Scheme and to the financial returns received by milk producers. Under the Scheme, the Board must buy all milk offered to it ; production has been increasing, and the gradually rising proportion of milk realizing only manufacturing prices—which averaged 5·52*d.* per gallon in 1935–36, compared with 5·92*d.* per gallon in the previous year—lowers the price received by all producers. This question was referred to by the chairman of Board at the annual meeting in the following words : " If there is to be any measure of price stability for milk producers in this country, there must be introduced into the Scheme some method of relating price to sales realization in the different markets by the introduction of a standard basic quantity of liquid sales for each producer. The ever-open door to all and sundry to market new supplies of milk on equal terms with those who have been milk producers for many years is inequitable and dangerous " (Ref. 9).

The finding of a solution to this problem will be one of the most important matters before dairy farmers during the next year. The introduction of a broad agricultural policy which would place beef production on a better basis, would cause many to cease cow-keeping and revert to their former methods of farming and thereby lessen milk production. It is also doubtful if a basic quota of milk from each farm would be a desirable measure if its operation were to prevent a proportion of the best and cleanest milk becoming available for direct consumption and were to accord this privilege to an inferior product. Reference was made in the last year's review to the Milk Reorganization Commission appointed in February, 1935, to consider and report on the organized marketing of milk in England and Scotland. This Commission had not reported at the time of writing, and its findings on this and other important points were being anxiously awaited by the whole milk industry.

The special steps taken by the Milk Board to increase the demand for liquid milk and to improve its hygienic quality have made steady progress. The Milk-in-Schools Scheme continues to provide bottles of milk containing one-third of a pint to some two-and-a-half million children on the customary school days, and in this way is helping to raise their standard of health and efficiency. In addition, 191,000 children in England and Wales are estimated to have been receiving milk under arrangements outside the scheme.

The Accredited Milk Producers' Roll Scheme, whereby those producers who quality for the Roll receive an additional 1*d.* per gallon from a fund to which all producers contribute, has made marked progress. The number of accredited producers has risen month by month. In May, 1936, there were 16,211 accredited producers compared with about 800 Grade A producers before the scheme was introduced in May, 1935. The apparent progress of this scheme has shown marked variation throughout the country, mainly because of the differences between county and other local authorities in their interpretation and administration of the regulations affecting milk production. This subject was dealt with in a paper on " Modernizing Cowsheds and the Administration of Dairy

Regulations" at the Farmers' Club in March, 1936 (Ref. 10). It was suggested that one method of remedying the lack of uniformity would be the issue of Orders from the Ministries of Health and Agriculture, with explicit definitions and instructions. By this method uniformity could be reached in such matters as the best procedure for sampling milk and the right kind of equipment for cooling milk and for sterilizing the utensils; but it was not applicable to the construction and equipment of cowsheds, because local conditions of climate, altitude and soil varied so greatly. In a Circular to County Councils and Sanitary Authorities (Ref. 11) issued by the Ministry of Health in April in connection with the new Milk (Special Designations) Order, which came into force on June 1st, 1936, the Ministry referred to the considerable divergence between the requirements made by different licensing authorities before licences are granted, and suggested that the requirements as to the arrangements and processes under and by which milk is produced, stored, treated and distributed should be as specified in the Milk and Dairies Order, 1926. The Ministry accepted the view that owing to "the great variety of individual circumstances it is not practicable to lay down any rigid and detailed code of requirements, and the governing condition must be whether, taken as a whole, the conditions at the farm are such that it may reasonably be expected that the milk can be produced and delivered to the consumer at all times of the year in accordance with the prescribed standards."

The new Milk (Special Designations) Order (Ref. 12) replaces the 1923 Order and amongst other changes the old grades of milk known as "Certified" and "Grade A (Tuberculin Tested)" are brought together in one grade, now described as "Tuberculin Tested," while the old "Grade A" designation is replaced by the name "Accredited." Certain changes in the bacteriological tests by which the grades will be examined will be discussed later (see p. 275).

II.—DAIRY CATTLE—BREEDING, TYPE AND MANAGEMENT.

The Efficiency of Dairy Cows.

The relative efficiency as milk producers of cows of different breeds and of different live-weights is receiving more attention in several countries. Efficiency might be considered simply in terms of the monetary value of the milk produced, but the results of this method of measurement are very largely influenced by the price received and according as the price does or does not take account of quality or fat-content of the milk. It does not measure the efficiency of the cow as a milk producer in relation to the amount of food she eats, and there can be no doubt that efficiency in this respect must have a considerable influence on costs of production.

The generally accepted definition of efficiency is the percentage ratio of output to input; when this definition is applied to milk production it represents the ratio of the energy in the milk produced in a given time (output) to the energy in the food consumed during the same time (input). To make such a calculation it is obviously necessary to have the energy in the milk and the food stated in the same units, and this can only be done by calculation from the weight and chemical composition of the milk and of the food eaten by the cow.

It is well known that the milk from different cows varies in chemical composition. To enable different animals to be fairly compared, an American investigator—Gaines—has devised a method (Ref. 13) by which a given quantity of milk of given composition can be stated as an equivalent of milk containing 4 per cent. of fat or "fat-corrected milk" (F.C.M.). The formula used in this calculation is F.C.M. $= 0{\cdot}4M + 15F$ where M represents the weight of milk in pounds and F the weight of fat in pounds, or F.C.M. $= M\,(0{\cdot}4 + 0{\cdot}15f)$ where M represents the weight of milk in pounds and f the average percentage of fat for a lactation period or other unit of time. Two cows producing different yields of milk with different percentages of fat can be compared thus: Cow A produces 10,000 lb. milk containing 3·0 per cent. fat, hence her output of F.C.M. $= 10{,}000\,(0{\cdot}4 + 0{\cdot}15 \times 3) = 10{,}000 \times 0{\cdot}85 = 8{,}500$ lb. Cow B produces 7,600 lb. milk containing 4·8 per cent. fat, and her output of F.C.M. is $7{,}600\,(0{\cdot}4 + 0{\cdot}15 \times 4{\cdot}8) = 7{,}600 \times 1{\cdot}12 = 8{,}512$ lb. These figures show that, in spite of the difference in the yield and composition of their milk, the two cows in question have almost identical outputs of energy. It will be noticed that the formula takes account of the milk yield and the fat content and apparently neglects the solids-not-fat; this is, however, not really the fact, because it has been shown that the fat percentage is a very good measure of the properties of the entire and normal milk of the cow. From the milk yield and fat percentage, therefore, the energy output in milk production can be accurately estimated.

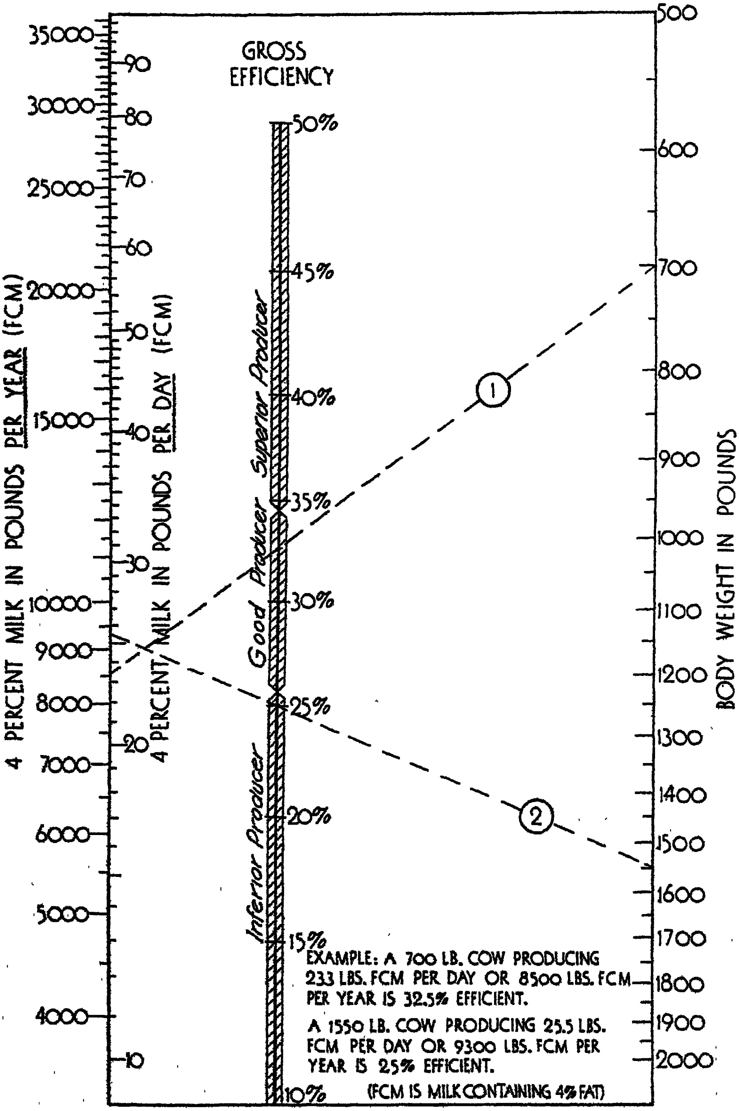
The measurement of efficiency in milk production has been carried a stage further by the work of Brody, Proctor and Ragsdale of the Missouri Agricultural Experiment Stations (Refs. 14 and 15). These investigators, after a careful study of data collected on experimental cows in the College herd, and covering milk yield, food consumption and live-weight, as well as of similar data from other sources, feel justified in assuming: (*a*) that the energy in the diet required for milk production is directly proportional to the energy in the milk produced; (*b*) that the digestible nutrients needed for a gain in live-weight are directly proportional to the gain in live-weight; (*c*) that the digestible nutrients needed for maintenance are proportional not to a simple body-weight, but to body-weight raised to the 0·73 power; (*d*) that the heat value of 1 lb. of total digestible nutrients in the diet is 1,814 Calories and that of 1 lb. F.C.M. is 340 Calories; and that 0·305 lb. of total digestible nutrients is required to produce 1 lb. F.C.M. This last assumption means that 1,814 × 0·305 = 553 Calories in the food (apart from maintenance needs and any increase in live-weight) is required to produce 340 Calories in the milk; the net efficiency is therefore $\frac{340 \times 100}{553}$ or 61 per cent. This is the efficiency of the mammary gland, and represents the theoretical maximum efficiency in milk production.

As the maintenance needs of the cow must be supplied out of the food she eats, the gross efficiency must always be under 60 per cent. The lower the yield (milk and fat) the greater will be the proportion of the food used for maintenance and hence the lower will be the gross efficiency. The application of this method to a large number of cows has led these workers to classify cows into three general groups: inferior producers with an efficiency of 15 to 25 per cent; good producers with an efficiency of 25 to 35 per cent. and superior producers with an efficiency of over 35 per cent.; and to state that the efficiency in milk production—the ratio of milk energy (output) to total digestible feed energy (input)—is on the average about 30 per cent. for good producing cows, the exact value varying with the milk yield. Ready-reckoner tables have been prepared by these workers to simplify the calculation of the efficiency of cows when the milk yield, fat percentage and live-weight are known. A chart for the same purpose is given (see p. 268).

Little attention has been paid in this country to the estimation of the efficiency of British cows on the lines indicated, but the subject is certainly worth study and might be found to supply an improved method of assessing merit in show milking trials. In many such trials the yield and quality of the milk and the live-weight of the animal are known. Edwards (Ref. 16) has applied the method of calculation described above to 705 cows, of nine different breeds, exhibited at the London Dairy Show and milked three times daily, between the years 1923 and 1935, and his results are set out in the following table (see p. 269).

Edwards draws attention to the wide differences in live-weight, daily milk yield and fat percentage between the various breeds, and points out that, in spite of these differences, the breeds do not differ in efficiency of milk production (under Dairy Show conditions) by more than 5 per cent.

One comment appears to be necessary on the method described and used above. Brody and his associates assume that the milk



EXAMPLE: A 700 LB. COW PRODUCING 233 LBS. FCM PER DAY OR 8500 LBS. FCM PER YEAR IS 32.5% EFFICIENT.

A 1550 LB. COW PRODUCING 25.5 LBS. FCM PER DAY OR 9300 LBS. FCM PER YEAR IS 25% EFFICIENT.

(FCM IS MILK CONTAINING 4% FAT)

This chart may be used to determine the approximate efficiency with which cows of various productive capacities produce milk. First, the pounds of the given milk must be converted to pounds "FCM," that is, to milk containing 4 per cent. fat. The efficiency of milk production is then read from this chart. Thus if it is desired to find the efficiency of a 700-pound cow producing 8,500 pounds yearly, or on the average 23·3 pounds daily, of FCM (4 per cent. milk), place a straight-edge between 23·3 on the left (or milk) scale, and 700 on the right (or body-weight) scale, and read the answer 32·5 on the centre (or efficiency) scale.

GROSS EFFICIENCIES OF COWS OF DIFFERENT DAIRY BREEDS AT THE LONDON DAIRY SHOW.

Breed.	Gross efficiency.	Average live-wt.	Average daily milk yield.	Fat percentage.	Wt. of 4% milk.
	%	lb.	lb.		lb.
Ayrshire	42½	1,226	66·73	4·23	69·07
Jersey	41¼	902	44·60	5·00	51·29
Br. Friesian	41	1,409	72·89	3·76	69·97
Guernsey	40¼	1,042	49·50	4·40	52·50
Dairy Shorthorn	40	1,338	61·54	4·07	62·28
Red Poll	40	1,218	56·64	4·12	57·49
Kerry	39¾	922	43·08	4·56	46·61
South Devon	37½	1,540	54·69	4·54	59·17
Dexter	37	747	33·62	4·02	33·72

produced, the maintenance needs of the cow, and any increase in live-weight together account for the total nutritive value of the diet. This assumption is probably justified where the diet is reasonably adjusted to the live-weight and milk output, but in cases where heavier feeding is resorted to in order to stimulate the maximum milk yield, it is almost certain that the nutrients in the ration are less fully used and that the output is, therefore, lower in proportion to the input. This state of affairs often obtains at shows, and unless the actual foods consumed are known and the total input calculated from this information, estimates of efficiency by Brody's method will give higher figures than are warranted by the actual conditions.

Brody and Ragsdale also discuss the relative values of large and small cows. The results of their investigations show that the small cow tends to be slightly more efficient in the use of food; that is, the large cow's extra milk production does not quite pay for her extra food consumption. They add, however, that " the slightly greater investment and overhead cost involved in keeping a larger number of smaller animals to maintain the same production attained with a smaller number of larger animals, tend to counterbalance the slightly greater efficiency of smaller cows so that from a commercial standpoint there is perhaps no difference between the profitableness of large and small cows." This conclusion is most probably correct for cows within a breed where the milk is sold on a uniform basis, but it does not necessarily apply in a comparison of cows of different breeds producing milks of different fat contents, and where fat content is taken into account in fixing the price. They conclude that udder capacity and the stimuli to high milk production are more important in profitable milk production than size, and suggest that progressive breeders of dairy cattle should select breeding animals primarily on the basis of efficiency, measured on the lines they have indicated.

III.—SECRETION OF MILK AND MILKING.

The Secretion of Milk. Influence of Hormones.

In previous issues of this review details have frequently been given of new knowledge acquired on the structure of the cow's udder and on the process of milk secretion. Research work on this subject is being carried on in several countries and, although many of the reports issued are of a highly technical nature and by no means easy to translate into simple language, it seems desirable that a short reference be made to some of the results obtained.

Turner of the Missouri Agricultural Experiment Station, and Folley of the National Institute for Research in Dairying have written simplified accounts of some of the recent discoveries (Refs. 17 and 18). Turner points out that the growth of the udder during pregnancy and the secretion of milk after parturition are well known happenings and that it was formerly thought that there must be a direct nervous connection between the uterus and the mammary gland. Early experimental work showed that the normal nervous connections could be severed in pregnant animals and yet the mammary glands would continue to grow and would secrete milk after parturition. Further, the mammary glands of the experimental animals could be removed and grafted successfully into other parts of the body, with subsequent growth and secretion of milk. These experiments led to the belief that the mammary glands, in common with certain other organs of the body, were stimulated by some substance flowing in the blood stream. Progress in the study of this problem discovered that small structures were scattered throughout the body, whose function it was to secrete such a substance. As these structures did not have ducts into which they poured their secretions, they were called *ductless* or *endocrine glands* and the substances they excreted were called *hormones*. Within recent years large numbers of hormones have been discovered, and some of these have come into general use for the replacement of deficiencies in the body. Of these, insulin from the pancreas and thyroxin from the thyroid gland are probably the most widely known. Further research work on this subject indicates that hormones are definite chemical compounds which, even though present in the blood in very minute dilutions, have the ability to stimulate the activity of the cells of certain organs of the body. Reproduction and milk secretion have been found to be controlled by hormones secreted by the ovary, which cause females to come "into heat" and later bring about the development of the mammary gland, and by another hormone, secreted by the anterior lobe of the pituitary gland, which brings about the secretion of milk. Much still remains to be discovered regarding hormones and their functions, but the knowledge outlined above has been used to bring about the secretion of milk in castrated immature guinea pigs and rabbits of either sex. Injections of suitable hormones brought about the development of the mammary glands, and further injections of the lactation hormone caused a copious secretion of milk.

The secretion of milk is also influenced by the hormone *thyroxine.* Graham and Folley at the National Institute for Research in Dairying (Refs. 19, 20 and 21) and Jack and Bechdel at the Pennsylvania State College (Ref. 22) have shown that the feeding of dried thyroid gland or the injection of thyroxine causes, in the case of cows in a stage of declining lactation, an appreciable increase in the milk yield without any depression of the fat and solids-not-fat percentages. On the other hand, such treatments have no material effect on cows during the period of maximum production. Folley and White, however, also found that the production of milk fat and non-fatty solids continues to increase after the effect of the hormone on milk secretion has reached its maximum, thereby raising the percentages of fat and non-fatty solids.

Turner asks a question which must arise in the minds of many who read the results of these discoveries—what is the practical value of this knowledge? His answer is that such investigations may suggest practical methods of bringing into lactation sterile cows which can no longer be brought into milk in the normal manner; it is also possible that the rate of decline of lactation may be reduced, or that lactation may be increased at intervals by the periodic injection of the hormone which stimulates milk secretion. He adds that all the knowledge concerning the relation of hormones to milk secretion has been obtained during the last ten years, and that it is not too much to hope that many of the more practical phases of the problem will be solved within an equal period in the future.

Milking Machines and Milk Yields.

The conclusion arrived at by Bartlett and Huthnance, and reported in last year's review—that cows milked by machine are slightly less persistent in milk production than those milked by hand—has been confirmed by experimental work in other countries.

In Denmark, Eskedal carried out a comparison of the influence of machine milking and hand milking on milk yield in six trials with 214 cows (Ref. 23). The results obtained show that the yield of the groups of cows milked by hand declined at a slower rate than that of the machine-milked groups; the difference amounted to 2·2 lb. of 4 per cent. fat-corrected milk per cow daily in favour of the cows milked by hand. It is stated that the hand milking was done by better milkers than the general average on Danish farms, but the same could probably be said with equal justice about the operation of the milking machines. The virtue of machine milking is that it makes the work more agreeable and that, in the larger herds, it is an insurance against labour troubles and sickness amongst the milkers.

At the New York Agricultural Experiment Station, Dahlberg (Ref. 24) studied the milk yields of cows which were milked by machine during their first, second and fourth lactations and milked by hand during their third lactation. The herd where the comparisons were made had been continuously milked by machine for the last twenty-seven years, so that the experiment showed the influence of a change to hand milking upon the production of machine-milked cows. Data were obtained from seven cows over the four lactations, and the conditions of health, breeding and management were reasonably uniform throughout. Dahlberg reports that slightly more milk was obtained during the third lactation by hand milking than during the fourth lactation by machine milking, but the difference in production was evident only after the third month of the lactation period, the hand-milked cows being slightly more persistent. The percentage of fat in the milk was not affected. Dahlberg is of opinion that these results should not affect the extent to which milking machines are used on farms, as the differences in total production per cow were small, and mainly indicated the need for care in the operation of the machine. He adds that the custom in the Experiment Station herd was to leave the teat-cups on each cow until she was practically dry, when the udder was massaged by hand for a fraction of a minute and any milk still remaining in the udder was stripped by hand into the teat-cups; he states that the units were in operation on each cow for an average of nine to ten minutes. He considers that this period is much too long; further experiments are now in progress in which the machines will be left on the cows for the minimum period required to secure most of the milk (which is from four to six minutes per cow) after which period the machines will be removed and the milking finished by hand.

Problems associated with the rate of machine milking have been investigated by Foot at the National Institute for Research in Dairying (Ref. 25). The rate of milking was determined by the use of an accurate spring balance graduated in tenths of a pound, a stop-watch, and suitable equipment for hanging the balance from the cowshed roof. The milking-machine unit was suspended from the spring balance in its normal position at the side of the cow and about 3 inches above the floor. When milking commenced the entrance of milk into the pail was recorded on the dial and readings were taken every twenty seconds. Three different machines were used and 375 milkings, of thirty different cows at different stages of lactation, were recorded. A wide range occurred in the time required to complete the milking, which was assumed to be ended when less than 0·3 lb. was obtained during two consecutive twenty-second periods; there was, however, a fairly clear *minimum* time varying from two and one-third minutes, for a cow yielding 6 lb. of milk, up to five minutes for a cow yielding 27½ lb. The method of the experiment could not indicate an optimum duration of machine milking, but only 8 per cent. of the tests occupied eight minutes or more. When the data on the rate of milk flow were studied the weight obtained from cows in full milk was as much as 4 to 5 lb. per minute. The main conclusions are in close agreement with the observations of hand milkers and are: (1) that, with some cows, the rate of flow was checked temporarily about half to one minute after milking commenced; (2) that the maximum rate of flow was reached about two minutes after milking commenced; (3) that a very much more rapid rate of flow was recorded with high yields than with low yields and, (4) that the decrease in the rate of flow near the end of milking was rapid, especially with high yields.

Some interesting information regarding the increase of machine milking in milk-recorded herds in Scotland is supplied by McCandlish and Struthers (Ref. 26). A survey carried out by the recorders of the Scottish Milk Records Association showed that, in 1929, 94 herds out of 708 (or 13 per cent.) were milked by machines, whereas in 1934, the number had increased to 129 out of 742 (17 per cent.). The number of cows milked by machine in these herds in 1929 was 6,083, giving an average per herd of 64; in 1934, the 129 herds contained 7,388 cows, giving an average of 57 per herd.

IV.—THE COMPOSITION OF MILK.

Variations in the Solids-not-Fat Content.

The frequent occurrence of samples of milk known to be genuine, yet containing less then 8·5 per cent. of solids-not-fat, has led to the giving of increased attention to the circumstances under which such milk is produced, and to the causes which may contribute to this result.

Bartlett (Ref. 27) has continued his investigations on the causes which bring about a decrease in the chemical quality of milk during the summer months. It had been noted that this depression in quality was greatest during hot dry summers when the cows were subjected to higher temperatures than usual, as well as to other unusual influences such as changes in the nature of the food due to the dried-up condition on the pastures. An experiment was carried out to obtain information on the effect of temperature alone and the method adopted was to house two cows during winter in a part of a cowshed boarded off so that it could be artificially heated to a temperature of about 80°F. while two similar cows were housed in the ordinary manner at an average temperature of about 40°F. Feeding, milking, stage of lactation and general management were almost identical for the two pairs; ample ventilation was provided in the hot box and the cows were not exercised. In the course of the experiment the pairs of cows were changed over between the hot and cold conditions. The data collected showed that the high temperature had no significant effect on the milk yield or the fat percentage but that the solids-not-fat percentage (in the fat-free milk) was reduced by 0·15 per cent. The odds that this result was not due to chance were 44 to 1. Bartlett concludes that, although the experimental conditions of temperature were continuously higher than English summer conditions, the depression in the quality of the milk was relatively small, and he believes that high temperature is not the only factor responsible for low-quality summer milk.

The effects of different foods and rations on the fat and solids-not-fat content of the milk of cows known to be yielding milk consistently low in solids-not-fat have been studied by Stewart and Tocher (Ref. 28). Four cows were used for these experiments over three lactation periods and the effects (*a*) of good grazing with a supplementary ration, (*b*) of well-balanced normal rations, (*c*) of a high-protein ration and (*d*) of a high-carbohydrate ration were studied. The results obtained are expressed in the following conclusions: (1) The change from a poor winter ration to pasture produce a decided increase in the solids-not-fat percentage in three of the four cows; the increase was not so marked in the next year when the change was from a good winter ration to pasture; (2) well-balanced rations given during two lactations gave a small rise in the milk yield and solids-not-fat content during the second lactation, but did not raise the solids-not-fat above 8·50 per cent; (3) a high-protein ration (50 per cent. above normal requirements) produced no change in the milk yield or in the fat percentage, but decreased the solids-not-fat; (4) a high-carbohydrate ration did not affect the milk yield or the fat percentage but slightly decreased the solids-not-fat. These workers conclude that heredity has a much greater influence than the conditions of management on the milk-producing capacity of cows and that "the solution to the problem of deficient milk must be the careful selection of cows with good milk records and a good milking pedigree." In this connection it may be pointed out that the determination of the average solids-not-fat percentage for individual cows is not yet provided for in any milk-recording scheme in this country.

The level of the fat percentage is believed to indicate the level of the solids-not-fat content but this relationship requires further study.

The effect of different rations on the solids-not-fat content of milk has also been studied in South Africa (Ref. 29) where complaints from cheese factories had drawn attention to the low quality of the milk from commercial herds. The rations used were of three types : (*a*) a high-concentrate ration, containing 6 lb. mixed concentrates per gallon of milk, 4–5 lb. hay and 9–10 lb. maize silage; (*b*) heavy-dry-roughage ration, viz., 17–18 lb. hay, 8–9 lb. maize silage and 2 lb. mixed concentrates per gallon of milk ; (*c*) high-succulent-foods ration, viz., 45–46 lb. maize silage, 4–5 lb. hay and 2 lb. mixed concentrates per gallon of milk. The three rations contained almost identical amounts of digestible protein and total digestible nutrients. The results obtained showed that (1) when the heavy-concentrate ration was given the solids-not-fat percentage in the milk followed the ordinary trend with the advance of lactation—a slight gradual increase ; (2) when the heavy-dry-roughage or the heavy succulent ration was given there appeared to be a slight depression in the solids-not-fat percentage ; (3) the milk production of the cows on the heavy-concentrate ration did not fall as fast as that of cows on the other two rations ; on the other hand, the butter-fat percentage of the cows on the high-concentrate ration did not increase to the same extent as that of the cows on the dry and succulent rations ; this, however, was probably due to the slower decline in milk production of the former. It is suggested that, in South Africa, the lack of selection and breeding for high fat percentage has adversely influenced the solids-not-fat percentage, as these two properties are closely related.

It would appear that steps have been taken by the dairying authorities in South Africa to obtain the necessary information as to the fat *and solids-not-fat* content of the milk of individual cows, so that breeders may be able to make selections for breeding purposes of cows which combine high yields with high quality of milk. The *Journal of the South African Department of Agriculture* (Ref. 30) publishes from time to time a list of records showing for each cow the yield in lb. of milk, fat and solids-not-fat, and the number of days, up to a maximum of 300, during which the record was made.

V.—Management of Milk and Milk Utensils.

The Bacteriological Grading of Milk.

Since the introduction of the Milk (Special Designations) Order, 1923, which contained regulations for the grading of milk and which stated maximum bacterial contents permissible in the different grades, milk producers and distributors have become more or less familiar with the bacteriological tests then instituted and with the meaning of these tests in relation to conditions of production and handling. From time to time, however, the method by which the results of the tests were stated, and even the tests themselves, have been criticized and suggestions made that new tests, or tests found to be useful in other countries, might be introduced.

The 1923 Order has now been superseded by the Milk (Special Designations) Order, 1936, which (except on a few points) came into force on June 1st, 1936. In view of the large increase in the number of farmers who are now, by reason of the success of the Accredited Milk Producers' Roll Scheme of the Milk Marketing Board, producing milk under this Order, it seems desirable to summarize the changes which have been made in bacteriological standards and tests, and to give some explanation of the reasons for these changes.

In the 1923 Order (Ref. 31) there were two grades of milk from herds in which all cows had passed the tuberculin test, namely (1) "Certified," which had to be bottled on the farm, and which must not contain more than 30,000 bacteria per cubic centimetre and no coliform bacillus in 1/10th of a centimetre, and (2) "Grade A (Tuberculin tested)" which could be sold by the producer in bulk and which must not contain more than 200,000 bacteria per cubic centimetre and no coliform bacillus in 1/100th of a cubic centimetre. The 1936 Order (Ref. 12) condenses these two grades into one—"Tuberculin Tested"—which, up till December 31st, 1936, must contain no more than 200,000 bacteria per millilitre (cubic centimetre under a new name) and no coliform bacillus in 1/100th of a millilitre, and which, after December 31st, must satisfy a methylene-blue reduction test and comply with the same standard with regard to coliform bacilli.

The chief changes here are the disappearance of "Certified" as a designation and a grade of milk of the highest standard of cleanliness, and the replacement, after December 31st, 1936, of the bacterial count (as determined by the "plate count" method) by a colour test in which the hygienic condition of the milk is judged by the time taken to decolorize or "reduce" a definite quantity of a dye added to a definite quantity of milk. Samples in which the dye disappears in less than four-and-a-half hours in summer and five-and-a-half hours in winter will have failed to comply with this new standard. Permission is also given for the new "Tuberculin tested" milk to be pasteurized, in which case is must not contain more than 30,000 bacteria per millilitre.

Milk from herds which were subjected to veterinary inspection every six months was described in the 1923 Order as "Grade A," and such milk had to comply with the same bacteriological standards as "Grade A (Tuberculin tested)." In the 1936 Order the name "Grade A" disappears and is replaced by the name "Accredited," and such milk must comply with the same tests as are prescribed for raw Tuberculin tested milk. Further, the old "Grade A milk" could, if pasteurized, be sold as "Grade A Milk Pasteurized." This is not permitted under the 1936 Order, which allows the designation "Pasteurized" to be applied both where "Accredited" milk and where ungraded milk is pasteurized in accordance with the requirements of the Order. The bacteriological requirements of pasteurized milk are the same in both Orders—not more than 100,000 bacteria per cubic centimetre or millilitre—but the new Order imposes further conditions with regard to thermometers and temperature records.

The evidence which has led the Ministry of Health to replace the plate-count test by the methylene-blue reduction test is contained in an exhaustive report by Wilson and others issued by the Medical Research Council (Ref. 32). The report deals first with the methods of taking samples of milk for bacteriological tests, and, after discussing the difficulties, recommends methods for taking samples from churns, rail tanks and bottles. It is also recommended that, instead of testing samples at any time after production, all samples should be kept at atmospheric temperature for a fixed period after milking and then examined, either immediately or after refrigeration overnight. This recommendation is incorporated in the new Order in respect of samples of raw milk taken while it is in the possession of the producer. Such samples, if from morning's milk, shall be kept at atmospheric temperature until 6 p.m. (approximately twelve hours) and samples from the evening's milk shall be kept at atmospheric temperature until 10 a.m. the next day (approximately eighteen hours) and, if the test is not then immediately begun, the sample shall be cooled and kept at 32° to 40° F. until tested, which it must be within eighteen hours.

A large section of the report is devoted to a study of the plate count, and very definite conclusions are given. It is stated that the plate count is an inaccurate and unreliable method of ascertaining the number of organisms in raw milk. It is inaccurate mainly because the bacteria, instead of existing singly, are often grouped in chains or clumps, yet many of these clumps will be counted as though they were single bacteria. It is unreliable because the conditions of the test discover only those kinds of bacteria capable of growing under particular conditions. There is also a difficulty, owing to differences between workers, in getting uniform results from different tests of the same sample. Mattick and others have also investigated this point (Ref. 33) and conclude that when two observers with the same training examine the same sample of milk by the same technique the differences in the results are not greater than when one worker examines the same sample in duplicate; when, however, portions of the same milk are examined by different observers in different laboratories, wide differences are found in the results, and the practice of comparing results from one laboratory with those of another must be abandoned.

Wilson goes on to state that the final result of the plate count under the best conditions is correct only within wide limits and the statement of the result in figures gives a fictitious appearance of accuracy. Further, the test is costly and requires highly skilled workers. He therefore recommends that the plate-count test be discontinued as a method of grading ordinary raw milk. For pasteurized milk also, the plate count is not recommended, but, apparently in the absence of a better test, this method is retained for the grades of pasteurized milk in the new Order.

The test for coliform organisms is also dealt with and the conclusion reached is that this test, though of definite use in the examination of water supplies, is of little value for assessing the cleanliness of the production of ordinary market milk; it might, however, occasionally be of value in the control of the highest grades of raw milk. For pasteurized milk, on the other hand, the coliform test may be of some value. This test, however, is retained in the new Order for two grades of raw milk.

The Methylene Blue Reduction Test.

This test is well known to bacteriologists and is in common use in many dairying countries as a means of classifying milk. The method of making this test which was in use a few years ago was criticized because it was unsuitable for the examination of really clean milk. Recent experimental work by Wilson and his colleagues has, however, led to their devising an improved method which, it is claimed, makes the test suitable for all qualities of raw milk. In this improved method 10 millilitres (ml.) of milk taken from the sample is placed in a special glass tube and 1 ml. of standard methylene blue solution is added. The tube is corked and turned over once or twice to mix the blue with the milk and is then placed in a water-bath maintained at 98·6° to 100·4°F. in complete darkness. Every half-hour the tube is inverted to renew the mixing. The test is ended when the colour completely disappears, which may happen in less than an hour in the case of a very dirty milk or in anything up to eight hours or over for samples of really low bacterial content. The standards of time stated in the new Order are four-and-a-half hours in summer and five-and-a-half hours in winter.

The scientific basis for the test is the fact that bacteria growing in milk abstract oxygen from their surroundings and cause conditions which result in a change of colour from blue to white. Wilson's report contains accounts of many experiments showing the superiority of the methylene blue reduction test over others for the grading of raw milk. It is claimed that it is a simple and inexpensive test with a very small range of error, and that it requires a minimum of equipment; it can be carried out by relatively unskilled workers on large numbers of samples; it can classify milks on the basis of cleanliness into as many grades as are desirable, which Wilson considers to be only three or four, such as clean, moderately clean, moderately dirty and very dirty; it affords a very good indication of the keeping quality of milk and it has two further advantages, namely, that it is not affected by the "clumping" of bacteria, which so seriously lessens the value of the plate count, and that it is more sensitive to the changes which must take place in the bacteria before they multiply in number; these changes are not reflected by the plate count for several hours, yet they materially affect the keeping quality of the milk.

There are, however, some limitations to the use of this test. It is admitted that it is not reliable for the examination of the milk of individual cows, because the milk of certain cows has a high reducing power, independent of its bacterial content; again it is doubtful, at present, whether the test is suitable for the examination of freshly pasteurized milk. Regarding the former of these limitations, Jackson (Ref. 34) has shown that milk drawn from the udder into a tube without the admission of air reduces the methylene blue almost instantaneously and that bacteria may play but an insignificant part in the reduction of the colour.

The report also recommends that the cleanliness of the milk of any producer should be judged, not on the basis of one or two samples, but on samples taken frequently and regularly throughout the year; also that penalization should not be practised so long as a given proportion of the samples, such as 75 per cent., conform to the standards.

Wilson's general conclusions in favour of this test are supported by the Medical Research Council in the preface to the report, where this sentence occurs: "It should therefore be of unrestricted value for the grading of milk on a basis of cleanliness and keeping quality, and should provide a satisfactory means whereby the milk of all producers can be regularly and frequently examined."

The cost of the test is not discussed in the report but the opinion is expressed that where large numbers of samples are tested at a time, the cost per sample will be only a fraction of that of the plate count. In this connection, however, it must be noted that if the number of samples from a producer or distributor is materially increased, the cost to the individual or to the administrative authority may be no less than under the existing plate-count system.

Reference must also be made to another aspect of the bacteriological examination of milk, namely, the testing of samples to aid a farmer to find out weaknesses in his methods of production. Several advisers in dairy bacteriology, though satisfied that the methylene blue test is of real value in the division of milks into broad classes, are not convinced that it should replace the plate count for advisory work. Thomas and Ralph (Ref. 35) have studied this subject in Wales and are of the opinion that the methylene blue test alone is not sufficiently sensitive to be used as a basis for bonus payments for good-quality milk nor for the purposes of advisory work in connection with clean milk production. They also adduce evidence to show that the test is not a realiable indication of the hygienic quality of milk which contains large numbers of coliform bacteria. There is not yet sufficient evidence to enable definite opinions to be formed on the extent to which the methylene blue test should be supplemented by plate counts and coliform tests in connection with the production of milk of low bacterial content and good keeping quality.

The Phosphatase Test for Pasteurized Milk.

There is no doubt that greater attention is being given to the pasteurization of milk for the liquid milk market in such a manner as will comply with the requirements of the Milk (Special Designations) Order. The use of the official designation "Pasteurized" milk implies, among other things, a guarantee that such milk shall have been retained at a temperature of not less than 145°F. and not more than 150°F. for at least thirty minutes and be immediately cooled to a temperature of not more than 55°F. Licences to use this designation are granted by the Councils of County Boroughs, Boroughs, Urban Districts and Rural Districts and it is the duty of these authorities to see that the conditions under which the licence is granted are complied with.

A circular recently issued by the Ministry of Health (Ref. 11) states that there is evidence that milk subjected to the pasteurizing process may in fact be improperly pasteurized on account of imperfect design and construction of the plant or through its being improperly and inefficiently operated and controlled, so that the requirements of the Order are not secured. An interesting report has been issued by the Ministry (Ref. 36) on "The Supervision of Milk Pasteurizing Plants" to assist the local authorities in the carrying out of their duties in respect of the granting of licences and the inspection of plants.

The Ministry also points out that a test for pasteurized milk has recently been devised. This test is described by Kay and Graham (Ref. 37) who point out that until recently there was no satisfactory test which could be applied to the milk itself to assess the efficiency with which it had been pasteurized. The new test, known as the phosphatase test, depends on the use of chemical reagents to detect whether the enzyme phosphatase, which is a constant constituent of raw milk, is or is not present. Present experience of the test shows that a positive result, *i.e.*, the demonstration of phosphatase in milk, is conclusive evidence that the milk has not been properly pasteurized, or that milk which has not been pasteurized has been added to it. It is claimed that even relatively small errors in the pasteurization process, *e.g.*, heating at 143°F. instead of 145°F., or the addition of 0·3 per cent. (or even less) of raw milk to the pasteurized bulk may be detected by this test. Additional evidence on the need for such a test is supplied in a report by Kay and Neave (Ref. 38) on the application of the test to milk designated as pasteurized which was sold to the public or to school children under the "Milk in Schools" scheme. Of eighty-two samples examined some thirty-four, or 42 per cent., were found to be incorrectly pasteurized or grossly underheated. It is concluded that a disturbingly high proportion of pasteurizing plants both in London and elsewhere are either unable to pasteurize milk efficiently or are unsatisfactorily operated and that, from the samples examined, the milk sold to schools appears to have been pasteurized in many cases in a particularly casual way. The test has also proved a valuable aid in the supervision of plants.

Testing of Dairy Machinery and Apparatus.

The advent of the Accredited Producers' Roll Scheme has greatly stimulated the interest of farmers in up-to-date cowshed and dairy equipment, and special attention has been given to steam sterilizing outfits for dairy farm utensils. During the year two plants of this type have been tested and reported on by the Agricultural Machinery Testing Committee of the Ministry of Agriculture, and the essential information is given in the following paragraphs :—

Clifton Electric Sterilizer (Ref. 39).—This is an electrically heated sterilizing plant for dairy utensils comprising a steam chest, boiler, water feed device and an electrical control time switch assembled as one unit. The boiler is specially designed and has a tubular circulating system giving quick steaming. Two electrical heating elements having change-over connections for variable loadings are inserted at the base of the boiler, the whole being insulated. The time switch is clock-work operated and is capable of switching the elements off and on twice daily at any selected times. This fitting enables the outfit to be operated during periods of "off peak" loads. When the plant was operated as recommended an effective sterilizing temperature (210°F.) was attained and maintained without difficulty. The plant was clean and effective in operation and was fully automatic, the only attention required being the setting of the clock for the times of sterilization required and winding as necessary.

Avery Bulk Milk Scale Tank (Ref. 40).—The plant submitted for test consisted of an assemblage of weigh tank with cover, milk strainer and discharge valve with associated parts. The whole unit was found to be satisfactory and entirely suitable for the purpose for which it is designed.

"*Scaldwell*" *Sterilizer* (Ref. 41).—The plant consists of a steam chest in the form of a galvanized iron cylinder, 3 feet 6 inches in diameter and 3 feet deep, mounted horizontally; a boiler pan in the form of an open metal tray let into the base of the steam chest with an automatic water feed from a reservoir which maintains a constant shallow level in the tray; and four oil heating units of the Florence wickless type fed from a common reservoir. When the plant was operated as recommended an effective sterilizing temperature (210°F.) was attained and maintained without difficulty. When not in use as a sterilizer the plant will provide a continuous flow of hot water—30 gallons per hour at a temperature of 120°–125°F.

Owing to the demand for steam sterilizers for dairy farm utensils, trials and demonstrations have been held in different parts of the country. To aid in the interpretation of such tests a short note was recently published in the *Journal of the Ministry of Agriculture* (Ref. 42) pointing out that for adequate sterilization steam must be applied in such a manner as to subject the utensils to a temperature of not less than 210°F. for at least ten minutes. It has been proved that, with this time-temperature combination, heat penetration to all parts of a sterilizer loaded with utensils is ensured and a reasonable margin of safety provided under practical conditions. Tests should also provide information on the efficiency and economy of the plant, the frequency of stoking in coal-heated boilers, the ability to provide a supply of hot water according to the number of utensils to be washed and the construction and general convenience in operation.

VI.—CHEESE AND CHEESE-MAKING.

Payment for Milk for Cheese-making.

When the farmer makes his own milk into cheese on the farm, he is, or should be, interested in the value of the milk of individual cows for this purpose, so that those cows which produce milk of a low cheese-making value may be discovered, eliminated and replaced by more productive animals. Little attention has been paid to this question in Britain, although a considerable number of farmers who make cheese in the south-west of Scotland have taken up milk-recording and the testing of the milk of each cow for its fat content in order that they may find out the poor yielders and those which produce milk of poor quality.

Where milk is to be used for cream or butter production, the quantity of cream or butter obtained per cow will obviously depend on the quantity of milk and the percentage of fat it contains. It is well known that the fat percentage of milk is in a general way an index of the percentage of solids-not-fat (see p. 266) and hence the fat content of the milk has been taken to indicate its cheese-making value also. After many years of experience of the buying of milk according to its fat content, however, the cheese-making factories of New Zealand, and the farmers supplying them, have found that this method is not as equitable as it was thought to be, and much experimental work has been carried out by McDowall to discover a better basis (Ref. 43). This problem has not yet arisen in Britain, but, if the development of factory cheese-making continues, it is only a matter of time, and probably of quite a short time, before both sellers and buyers will desire some method which relates price to the cheese-making value of the milk, instead of a flat rate price per gallon; hence a brief account of the New Zealand work is given. In the report by McDowall it is stated that while payment on the basis of the percentage of fat is definitely more equitable than payment according to volume, there still exists some unfairness in the distribution of the proceeds. If the system of payment on fat percentage were fair, there should be a constant yield of cheese per pound of fat, whatever the fat content of the milk. Actually, as the fat content increases, there is, on the average, a drop in the yield of cheese per pound of fat. It has been found that with milk of high fat content (say 5·5 per cent.) the yield of cheese is 2·27 lb. per pound of fat; whereas, with milk of low fat content, say 3·5 per cent., the yield of cheese is 2·65 lb. per pound of fat. This difference is due partly to different percentages of casein in the milk and partly to other factors in cheese-making. The milk of high fat content contains more casein than the milk of low fat content, but the casein content does not rise in the same proportion as the fat. Hence milk of low fat percentage, though containing a lower percentage of casein, contains more in proportion to its fat content and therefore yields more cheese per pound of fat.

It follows, therefore, that the cheese-making value of milk can be more accurately assessed from a knowledge of the percentages of fat and of casein than from the fat alone, but until recently no suitable method of estimating casein was available. Such a test—the Walker test—has recently been brought into use, and investigations have shown a distinct and regular relationship between the casein content of the milk thus determined, the percentage of fat, and the yield of cheese. It is therefore suggested that a more equitable system of payment for milk for cheese making could be based on the calculated cheese yield, as deduced from fat and casein tests, with the aid of suitable ready reckoner tables. One objection to such a system is that no allowance has been made for variation in the costs of manufacture which would vary according to the yield of cheese per 100 lb. of milk. To meet this point it is suggested that, by a new analysis of costs, suitable adjustments could be made.

The system would be so operated that the milk from each supplier would be weighed and sampled daily as at present, composite samples for seven to ten days would be tested for fat and casein, and the cheese yield would be calculated. To enable the usual monthly payments to be made, an advance price per pound of cheese would be decided on, taking account of current cheese prices and commercial shrinkage.

Payment for milk on the basis of its cheese-making value leads to suggestions that it is desirable to find out by the same tests the cows which give the best return in cheese-making milk, but a system which can be applied to milk as delivered to factories may be impracticable or too costly for application to individual cows. This aspect of the question is receiving careful consideration.

JAMES MACKINTOSH.

National Institute for Research in Dairying,
Reading.

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THE FEEDING OF LIVE STOCK.

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I.—Nutrition and Public Health.

During the past year considerable public interest has been developed in the problem of the production and distribution of the national food supply, partly through the publication of evidence of widespread malnutrition of children, and partly through the political developments that have engendered a feeling of insecurity as to the safety of our food supplies in the event of war.

From the point of view of the home producer, the root difficulty of the problem is essentially one of economics, so far at any rate as the quantitative aspect of the problem is concerned. Increase of production and consumption are largely matters of price-levels to producer and consumer respectively. The problem of malnutrition, however, is by no means wholly quantitative, but embodies important qualitative factors, the improvement of which is only in relatively small measure a matter of economics.

The essential need of an adequate human dietary is that it shall be reasonably varied in character, and particularly that it shall include a suitable proportion of foodstuffs such as milk, eggs, fresh meat, fruit and green vegetables that will ensure a sufficiency of proteins, minerals, vitamins, and possibly other ingredients that are essential to healthy bodily activity at all times, and especially during the period of growth.

In the campaign against malnutrition the responsibility of the food-producer will not be discharged merely by the supply of adequate quantities of the required foodstuffs, but all must come up to certain standards of quality that are assumed in making up the dietary. If milk and eggs are being relied upon to provide the necessary vitamins the producer must see to it, by appropriate feeding of the cow and hen, that these are present; if vegetables are to safeguard the mineral supply the ground on which they are grown must be suitably supplied therewith. Attractiveness of appearance, palatability and aroma are other factors that contribute in less easily defined fashion to appetite and health.

It is all to the good, therefore, that the development of the interest of research workers in these quality problems, to which reference has been made in previous Reports, should continue to grow. The literature on the subject has now become very large and varied, and correspondingly difficult to review. Many workers are engaged upon the study of the intimate composition of foodstuffs, and the possibility of their enrichment in the ingredients desired; others are engaged in ascertaining what are the optimum requirements of the human being and of farm animals, whilst still others are engaged in studying the influence of various defects of "quality" either in the causation of disease—the deficiency diseases—or in the lowering of resistance against specific infections.

II.—NUTRITION AND DISEASE IN FARM ANIMALS.

That unsuitable feeding may predispose to disease is no new idea, but it is only during recent years that anything in the nature of reliable guidance on the subject has been obtained. Although great progress has been made in the study of "deficiency diseases" the information available is still very incomplete and in some details conflicting.

A valuable review of the broader aspects of the rôle of nutrition in the prevention of disease in farm animals is contained in a recent issue of Nutrition Abstracts and Reviews (Ref. 1), and a further review dealing in greater detail with the specific problem of the relation of mineral-supply to disease (Ref. 2) should also be consulted by those interested in the subject.

Investigation has hitherto been largely concentrated upon the study of the effects of deficiencies of minerals and vitamins, but evidence is accumulating of the existence of other factors, as yet unidentified, but probably present in natural foodstuffs such as grass and milk, that will eventually have to be taken into account in the formulation of the perfect dietary.

Troubles arising in farm practice from dietary deficiencies are largely associated with the "improvement" of breeds and the intensification of systems of production. Broadly speaking, the troubles are least serious under extensive systems, such as ranching, or other systems in which only a relatively low level of production is secured.

Even ranching methods, however, do not guarantee freedom from trouble, since over large areas of the world, especially in South Africa and Australia, the natural pasture does not supply sufficient phosphorus for full and healthy growth, especially in the case of modern breeds of stock. In other areas, such as parts of New Zealand, and possibly also of Scotland, iron deficiency would appear to be a causative factor of trouble with sheep. Over the greater part of Great Britain the most probable deficiency of the grazings would seem to be that of calcium (lime), but clear proof is difficult to obtain.

When we pass from open range to restricted grazing the risk of deficiency troubles is increased, and still more when we pass to indoor systems of stock raising, especially where the supply of natural food in the ration is small or non-existent. The acme of risk is thus attained in some of our modern systems of pig and poultry management, in which the animals are continuously confined to sties or cages, and are thus entirely dependent upon the competence and knowledge of the feeder. No scientist would claim that our present knowledge of nutrition is anything like complete, and it is certain that much of our intensive feeding is imperfect, and likely, in the long run if not quickly, to give rise to trouble. Practical experience already suggests, indeed, that although these highly intensive methods may be applied with comparative safety to animals that are to be killed at an early age, they certainly cannot yet be commended for the raising and subsequent management of breeding stock. On this point the concluding words of Dr. Fraser's review are incisive :—

"Where an animal is to be used for breeding, then it should be fed as nearly as possible on its natural food. To supplement a cereal ration by mineral elements and the few vitamins recognized to be of value to rodents is rather a caricature than an imitation of nature. It would be safer, until our present nutritional knowledge is far more complete and is proved applicable to herbivora, if all live stock intended for breeding were reared on abundance of grass and milk. Agricultural science for the last generation has been endeavouring to prove the beast a machine. But the animal organism is rather a china-shop where one false step will smash some fragile thing."

Apart from the direct effect of dietary deficiencies in causing specific troubles in the animal, there is the further possibility that these deficiencies may either increase the susceptibility of the animal to, or reduce its powers of resistance against, infections or other forms of trouble.

On this point the evidence for increased susceptibility is not as yet convincing, but that resistance to infection may be greatly reduced by a deficient diet is almost certain. The whole subject is one of great complexity and conclusive experiments are very difficult to design. Conclusive evidence of the effect of nutrition on infectious disease in farm animals is not yet available, but there is a considerable body of evidence for which it is difficult to suggest any alternative explanation. One of the clearest cases is that of the relation of diet to resistance against the establishment and maintenance of infestations with parasitic worms. This connection has been established in the case of sheep, pigs, fowls and dogs, and doubtless applies to other classes of live stock.

Calcium and Phosphorus.

The deficiency diseases which have received most attention from investigators are those associated with deficiency, or deficient assimilation, of the mineral elements calcium and phosphorus, which together form so large a portion of the mineral matter stored up in the skeleton. These diseases are of two distinct types, one occurring as the result of deficiency in the food, and the other occurring as the result of failure of the animal to keep the minerals in its blood between healthy limits. The two types may be related, but there is no necessary connection between them, particularly in the case of calcium. A low calcium supply in the food does not necessarily imply a correspondingly low level of calcium in the blood, whilst a high calcium supply in the food may on occasion be accompanied by an abnormally low calcium in the blood, as in the familiar phenomenon of milk fever. It is probably not without significance that milk fever is far commoner amongst "improved" dairy cows, bred for high milk-production and fed on mineral-rich rations, than it is amongst low-yielding cows reared under ranching conditions, even in areas poor in minerals.

Bone consists of a hard framework enclosing the blood-forming red marrow, and both parts contribute actively and continuously to the vital activities of the animal. The hard skeleton is the great nutritional reservoir for calcium and phosphorus and probably also for magnesium. It is an active tissue which undergoes continual changes throughout life and responds rapidly to demands from the blood.

The complex earthy salts, mainly calcium phosphate, with which the organic matter of the bone is impregnated, confer strength and rigidity. The continual withdrawal of calcium phosphate from the bone at a greater rate than its replacement from the food must thus eventually cause the bone to become weak. It becomes lighter and more porous, and the final result is the condition known as osteoporosis.

This condition may arise, as in parts of South Africa and

Australia, from the poverty of phosphorus in the pasture, or it may arise in the case of the high-yielding milch cow, even on a mineral-rich ration, if the udder is secreting calcium and phosphorus in the milk faster than the intestine can pass these elements from the digesting food into the blood-stream. Determinations of the mineral balance of lactating cows almost invariably show such a negative balance during periods of high milk-yield. American workers have found that the total calcium loss of a cow usually does not exceed 20 per cent. of its total skeletal supply, and that, as a rule, there is no serious interference with the milk-yield until the losses exceed this figure. "Such an animal is nevertheless almost pathological, oscillating between compact bone at the end of the dry period and a mildly porotic framework at the height of lactation." (Green.)

If for any reason the skeleton becomes weakened by removal of minerals, it usually attempts to repair the damage by laying down new organic tissue in preparation for subsequent deposition of minerals, but if this deposition does not materialize the bone remains soft and is easily bent. This effect is most obvious in the young animal (where the bone is still growing) and gives rise to the familiar distortions of the bone characteristic of rickets.

The causal factors may be deficiency of calcium, or of phosphorus, or of Vitamin D, or of any combination of these, since all three are necessary for normal bone metabolism. With grazing animals deficiency of vitamin D is unlikely since it is produced in the body by the action of the ultra-violet radiation of the sun.

A further bone trouble, largely confined to horses and goats (" big head "), is now known to be associated with a large relative excess of phosphorus over calcium in the dietary; such an excess occurs, for instance, in cereals and bran. Where hay is poor and cereals and milling by-products are heavily fed, a lime-rich mineral supplement may thus be desirable in horse-feeding.

Magnesium.

Just as low blood calcium makes for milk-fever so also low blood magnesium may cause trouble in dairy cows, the best known being " lactation tetany " or " grass tetany." It is not usually associated with deficiency of magnesium in the food since the actual magnesium requirement is very low.

Iron and Copper.

Next perhaps in interest and practical importance comes the problem of " nutritional anæmia " which is associated with deficiency of iron, and in smaller measure of copper. This trouble is met with in grazing cattle and sheep in many parts of the world, but in this country it is most frequently encountered in sucking pigs kept indoors. It would appear that in many cases the increase in the breeding capacity of the modern sow and in the growth-rate of her progeny have outrun the capacity of the mother to supply sufficient iron in her milk. The fact that some piglings in a litter suffer more than others, and that the frequency and severity of the trouble varies in different litters under apparently the same conditions, suggests that a genetic factor or factors may be involved. The acute stage of the trouble is usually confined to the period during which the pigling is taking nothing but the sow's milk; but even if recovery subsequently takes place it is not always perfect, and the effects—especially retarded growth—often persist over a long period.

Iodine.

Whether iodine deficiency is likely to be at all common in this country is still uncertain. Green states that "iodine deficiency in acute form is comparatively rare in farm animals except in certain well-defined areas of the world, but may occur sporadically even in Britain. Rationed animals may sometimes receive sub-optimal quantities of iodine and benefit by iodized salt. On the other hand, indiscriminate use of iodine supplements in excessive amounts may have adverse effects." He quotes "sporadic cases" of lambs born weak with enlarged thyroids in areas of Somerset and Dorset known to be on the border-line in respect of iodine deficiency and adds that "although the problem of iodine-deficiency is not acute in British farm practice the question of 'iodine intake below the optimum' merits further investigation."

Sodium and Chlorine.

One other common mineral deficiency remains to be mentioned—that of salt; the actual deficiency may be either of sodium or of chlorine. Salt deficiency is rarely met in animals at pasture or fed with greenstuff or hay; but it is well known among intensively kept pigs and poultry feeding on cereal rations, and it may also arise in the case of heavy-yielding milch cows. On the other hand, the detrimental effect of excess of salt is well known, although the proportion that may be consumed without apparent harm is fairly high. Some recent observations on this point are quoted in the next section.

III.—MINERAL REQUIREMENTS.

Dairy Cows.

The question of the requirements of the dairy cow for calcium and phosphorus has for some years been under investigation at several American centres, and a brief review may be given of points of interest from recent reports.

From the Beltsville Station of the U.S. Department of Agriculture a report has been issued (Ref. 3) giving the results of three experiments upon the effects on calcium and phosphorus metabolism of feeding low-calcium rations for long periods. It was found that under normal conditions of feeding the percentages of calcium and phosphorus contained in the fat-free bodies of mature cattle were remarkably constant, as was also the ratio of calcium to phosphorus either in the whole body or in the bone.

The keeping of cows on low-calcium rations for long periods caused relatively little change in these relationships. Although the rations supplied only about 25 gms. of calcium per head daily the calcium-content of the fat-free body still remained, after several years, at about 85 per cent of its normal, whilst the change in the calcium-phosphorus ratio was even smaller, namely, from 1·9 to about 1·8. Of the calcium supplied in the food it was found that about 50 per cent. was utilized by cows which had been fed low-calcium rations for nine months or more. In this report no conclusion is drawn as to the requirements of the dairy cow beyond the tentative suggestion that "for Jersey cows which are capable of giving 3,000 kg. (6,600 lb.) of milk or more annually an intake of 25 gms. of calcium daily is somewhat inadequate."

More definite recommendations are made in a paper from the Michigan Station, (Ref. 4), in which standards are suggested of 10 gms. each of calcium and phosphorus per 1,000 lb. live-weight for maintenance, and 0·7–0·9 gm. calcium + 0·5–0·7 gm. phosphorus per 1 lb. of milk. So far as phosphorus is concerned, this is substantially in accord with conclusions arrived at from experiments with dairy heifers at the Massachusetts Station (Ref. 5), in which no advantage was gained by increasing the supply of phosphorus above 18 gms. daily per 1,000 lb. live-weight in the first year of life, 17 gms. in the second year, and 12 gms. during the third year.

In experiments at the Minnesota Station (Ref. 6), reduction of the calcium content of the ration from 0·18 per cent. to 0·12 per cent. was found to reduce somewhat both the blood calcium and bone calcium, but had no measurable effect upon the yield or composition of the milk or on the fertility of the cow over the following two gestation periods. Assuming an average daily ration of 30 lb. of dry matter, the amount of calcium supplied, at 0·12 per cent., would be about 16 gms.

From the Pennsylvania Station a detailed report has been issued (Ref. 7) on the results of mineral balance studies with twelve cows; the studies covered more than a year and dealt with the metabolism of sodium, potassium, calcium, magnesium, phosphorus, chlorine and nitrogen on rations with and without mineral supplements. The broad conclusion from these experiments is that "moderately high-producing cows can satisfy their needs for calcium and phosphorus, as required for efficient milk production and the formation of a calf, from rations of either timothy or alfalfa hay" (or presumably good meadow hay), "with maize silage and concentrate mixture, and without calcium or phosphatic supplements, when virtually full fed, in accord with prevailing practice." Mineral supplements (bone meal or ground limestone) are likely to be required only when the roughage is abnormally poor in calcium or phosphorus, or when the allowance of roughage is very small. No mineral supplements should, therefore, be incorporated in commercial mixed feeds, but should be sold separately. Cattle are normally indifferent to bone meal unless suffering from acute shortage of calcium or phosphorus, and the authors suggest, therefore, that the cow's needs will be fully met if a 4 : 1 mixture of bone meal and salt is placed at her disposal, to take or leave as she may choose. Experience shows, however, that cattle sometimes require to be restricted to a fixed amount of the mixture; this is necessary if they are especially hungry for salt, or are suffering from severe calcium-phosphorus deficiency.

Calves.

Turning from adult cattle to calves, Irish experiments (Ref. 8) have demonstrated the necessity for keeping an eye upon the supplies of calcium and phosphorus in practical calf rearing. Here also the most important factor would appear to be the amount and quality of the fodder consumed. When good quality hay forms the fodder, and the feeding of it is so regulated that the calf, at the age of five months, is consuming 4 lb. per day, there seems to be no necessity to add lime to the diet; when, however, the hay is of poor quality, some addition of calcium is necessary.

Calves which are given a diet of coarse fodder, cereals, roots and oil-cake, and are fed very liberally on meals, necessarily consume only little roughage, and then often suffer from a calcium deficiency. This deficiency may be remedied either by a daily allowance of half-a-gallon of milk, or by the inclusion in the meal mixture of 15 per cent. of meat- or fish-meal; or, again, by the use of a supplement of sterilized bone flour or limestone. If the hay used is of poor quality, and especially if it is badly weathered, an addition of 1–2 per cent. of vitamin-rich codliver oil will effect further improvement, not only in the assimilation of calcium and phosphorus, but also in the digestibility of the ration. With good hay, however, provided sufficient of it is eaten, no advantage accrues from the use of codliver oil. Incidentally, it may be noted that, in these experiments, no advantage resulted from the addition of supplementary iron or iodine to the diets tested.

Pigs.

From Norway comes a report on the calcium and phosphorus requirements of growing pigs (Ref. 9). It is calculated that, on the average, 6·59 gms. of calcium and 4·24 gms. of phosphorus are retained in the body per 1 kg. live-weight increase. These figures correspond to a supply in the food (per 1 kg. L.W.I.) of about 15 gms. calcium and 8 gms. phosphorus, the latter being rather better assimilated than the calcium. It is suggested that the nature of any mineral supplement used should be varied according to the ratio of base to acid in the mineral matter of the ration. Rations consisting of cereals and skim milk are deficient in calcium, have an excess of phosphorus, and indeed an excess of acid radicles generally; for such rations a supplement of calcium carbonate is indicated. Rations of cereals, potatoes and skim milk, or of cereals, clover pasture and skim milk are also deficient in calcium, but have an excess of total bases over total acids; such rations would, therefore, be more appropriately supplemented by calcium chloride. Other experiments at this centre have shown that rickets never occurred in young pigs with rations in which there was a calcium-phosphorus ratio between 1·0 and 1·22.

The phosphorus requirement of growing pigs has also been studied in American experiments (Refs. 10, 11), which led to the conclusion that the minimum phosphorus requirement in the ration lay between 0·27 and 0·30 per cent. This is well below the content of the rations (of cereal meals, milling offals and protein concentrates or milk) commonly used in this country, and confirms the conclusions of earlier experimental work that mineral supplements for the pig, if required at all, need not include phosphorus.

Salt Tolerance.

Lastly in this section a brief reference may be made to two recent reports on the degree of tolerance of animals for salt. Tocher (Ref. 12) found that the amount of salt fed to pigs could be raised from 0·25 to 3 oz. per head daily without any apparent ill-effect, provided that the rise was made gradually. Up to 0·5 oz. there was some improvement of growth rate, but larger doses of salt, though not injurious, produced no further improvement. Poultry were found to tolerate salt up to 2·5 per cent. of their food, but higher proportions caused ill-health, while proportions of 7·5 per cent. and over proved fatal. In another series of experiments, in which the salt content of the ration varied from 0·5 to 8 per cent., no ill-effects were noticed until the salt exceeded 3 per cent. At 5 per cent. the fowls became listless and suffered from scouring, whilst at 8 per cent. two birds died and others suffered from severe diarrhœa, but recovered when put on a normal ration containing 0·5 per cent. of salt.

In French experiments (Ref. 13) with pigs fed on meal and potatoes, salt was added at the rate of 50 gms. per day for five days, 75 gms. per day for five days and 100 gms. per day for twelve days. No symptoms were observed apart from an increase in thirst. They then received 200 gms. per day for eight days, and finally 250 gms. (about 8¾ oz.) per day for three days. At the end of this period the thirst was acute, the urine abundant and the fæces liquid, but no symptoms were observed other than those of enteritis. This author concludes that poisoning by salt may be conditioned by the mode of administration (solid or liquid), the amount of water available to the animals, individual tolerance, and the type of food with which the salt is fed.

It seems clear that the popular belief as to the low tolerance of the pig and fowl for salt requires revision at least in so far as it refers to salt proper, and not to brine after use for pickling meat. Such brine has doubtless a more complicated action on the animal since, in addition to salt, it may contain potassium nitrate and various amines and other products arising from the putrefactive breakdown of proteins. Symptoms of poisoning by brine and salt certainly differ considerably, animals poisoned by brine being constipated and showing nervous symptoms, whilst those poisoned by salt show profuse diarrhœa and digestive symptoms.

IV.—PROTEIN SUPPLY.

Protein supply problems must always take a prominent place in any review of research in animal nutrition. For many years the attention of the agricultural investigator was largely focussed upon the quantitative aspects of protein requirements, but more recently a steadily growing share of interest has been devoted to the study of the qualitative differences in the make-up of the proteins of different foodstuffs which explain their observed differences in "biological value."

Biological Values.

The fundamental principles that underlie varying biological values have been discussed in previous *Guides* and we need only review here the further matter of interest on this subject that has been published during the year.

In all investigation the degree of accuracy of the methods used is clearly a matter of great importance. On this point an experienced American worker, Mitchell, has reported (Ref. 14) that the relative biological values of proteins obtained by the "nitrogen balance" method as used at the University of Illinois exhibit an average standard deviation of 3·7, the figure tending to rise as the biological value falls. He expresses the view that, provided the difference in biological value between two protein mixtures is more than 4 per cent., it may be regarded as statistically significant. The same conclusion is arrived at with regard to the alternative method of assessing biological values, which is based upon controlled feeding of the experimental animals in pairs, supplemented by carcase analyses. The results for the relative values of different protein mixtures for maintenance and growth, as found by each method, agree very closely.

The same paper contains the results of comparisons of raw and roasted peanuts, which show a slight lowering both in the digestibility and the biological value of the protein on roasting.

In other experiments at the same Station (Ref. 15), dried and liquid skim milks were compared, when it was found that as the temperature of drying rose up to scorching point the digestibility of the milk protein fell from 92 to 81 per cent. and the biological value from 89 to 70 per cent.

That heating of foods does not invariably produce this effect is brought out, however, in another American investigation (Ref. 16) dealing with soya beans and the oil-extracted meals derived from them. In this investigation at the University of Wisconsin it was found that when the beans were fed in the raw state the protein was of relatively low nutritive value as determined by the amount of growth per unit of protein eaten. Commercial soya meals made in the one case by the "expeller" process (by compression of the ground beans after heating to 105°C. for two minutes) and in the other (hydraulic) process by heating to 82°C. for ninety minutes, gave again the same low protein values. On the other hand, commercial soya meals which had been prepared at medium and high temperatures, *e.g.*, expeller meals processed at 112–130° and 140–150°C. for two-and-a-half minutes, or hydraulic meals cooked at 105–121°C. for ninety minutes, gave results for protein efficiency about double those obtained with the raw beans or with low-temperature meals. Of even greater interest perhaps to the British user of extracted soya meal (prepared by extraction of the oil with hot solvent) is the observation that meal of this character also showed much better results for protein quality than the raw beans. That the changes were due to alterations in the protein of the food seems clear from the experiments, although no evidence on the real nature of the change was obtained. It would seem that heat caused some essential protein fraction, which was unavailable in the raw soya bean, to become available for absorption and metabolic use.

In experiments with sheep at the Cornell Station (Ref. 17) the proteins of soya bean meal, when added to a basal diet very low in protein, showed a rather higher biological value (72·8 per cent.) than those of maize gluten (65·7 per cent.) and linseed meal (67·7 per cent.).

Reference was made last year to the work of the Hannah Dairy Research Institute on the supplementary values of different proteins in the rations of dairy cows. This work has now been extended by a study of the biological value of the proteins of grass in the fresh and dried forms (Ref. 18). The proteins of spring grass were found to be markedly superior for milk production to those of autumn grass. In neither case did the proteins suffer any appreciable loss of quality by artificial drying in a Ransome drier, where the temperatures in the two sections were 300° and 220°F. respectively. Three types of silage made from young summer grass (ordinary, A.I.V., and molassed silage) were found to be of substantially equal nutritive value, and their proteins showed biological values equivalent to that of the proteins of fresh spring grass.

Other experiments in which the proteins of blood meal were studied showed that in material prepared by a high-temperature process the proteins had a lower nutritive value than in that prepared by a low-temperature process.

Reference may also be made to Russian experiments with young pigs (Ref. 19) in which the biological value of the food protein was raised from the figure of 63 per cent. for the basal ration to 74 per cent. by the addition of fish meal, to 77 per cent. by ground lentils, to 84 per cent. by boiled lentils, and to 92 per cent. by the addition of yeast. That such improvements in biological value are actually reflected in improved growth is illustrated by Czechoslovakian experiments (Ref. 20) in which four rations differing in the lysine and cystine contents of their proteins were compared, using groups of ten pigs. Each ration supplied the same amount of digestible protein, but over a period of forty-two days the average live-weight gains ranged from 25 kgs. to 30·3 kgs. In this case the differences were attributed primarily to the higher lysine content of the proteins fed to the group that gave the best growth, and this, it is suggested, is the chief reason for the general superiority of animal over vegetable proteins.

Level of Supply.

Another protein-supply problem that has a definite practical importance is that of the effect of increasing the supply of food protein upon the efficiency of utilization both of the protein itself and of the other ingredients of the food. The bearing of this upon the proportion of lean to fat in the carcase may be instanced as one of many points of interest that arise.

Fundamental studies with rats are in progress at the Pennsylvania Institute of Animal Nutrition, and a report on data obtained at four different levels of protein supply (10, 15, 20 and 25 per cent.) is now available (Ref. 21). The diets were of equal energy values and differed only in protein content. The effects of increasing the protein content of the diet were (1) an increase in live-weight gain at decreased cost in terms of dry matter consumed ; (2) an increase in the efficiency of digestion and in the retention by the body both of protein and of energy-producing nutriment ; (3) an increase in the protein of the body but at a diminishing rate as the protein supply rose. There was no change in the amount of energy at the disposal of the animal, the improved digestibility being offset by increased waste in the urine ; and there was a diminishing efficiency in the utilization of the food protein as its amount was increased. There was no regular change in the total amount of fat gained, but usually a decrease in the proportion of fat gain to protein gained (or, broadly speaking, an increased ratio of lean to fat).

The last-mentioned observation is further confirmed by data obtained at the University of Illinois (Ref. 22) in experiments with pigs receiving different amounts of protein. It was found that as the protein content of the diet rose from a low level, the retention of nitrogen and the ratio of growth weight to food consumption rose up to a maximum which varied with the age of the animal, being higher for the younger than for the older animals. Carcase analysis of some of the animals showed that, within wide limits, the higher the level of protein feeding the higher was the proportion of protein to fat deposited during growth.

A similar conclusion was reached in practical feeding experiments with pigs at Beltsville (Ref. 23). Three groups of pigs received rations with nutritive ratios varying from 1 : 4 to 1 : 8. From the start, and throughout the feeding period, the high-protein group made the most economical gains. " There were indications that the ratio of lean to fat in the carcases was correlated with the protein content of the ration."

In contrast to these observations are the results of an experiment at Harper Adams College (Ref. 24) in which three lots of pigs received varying amounts of protein ranging from 65 lb. to 80 lb. per head. Here no advantage could be found from increased protein supply. Neither in growth rate nor in fatness, as assessed by measurements at five points along the back, did there appear to be any significant differences between the lots.

Protein and Sexual Activity.

As a further illustration of the varied character of applied protein research, reference may be made to some Russian work dealing with the question of the relation of protein supply to sexual activity.

In one set of experiments (Ref. 25) the comparative effects of animal and vegetable proteins upon the sexual activity of boars was studied. During an experimental period of ninety-eight days the introduction of animal protein (meat-and-bone meal) into the ration caused a marked improvement in the quality of the sperms. It is remarked, however, that this quality depends mostly upon the frequency of service by the boar. Optimal results were obtained where this was restricted to one service on alternate days.

In two other papers (Refs. 26, 27) from the Zootechnical Institute of Moscow the results are given of observations on rams and stallions. In the tests with rams, sorghum, millet and barley proved to be effective substitutes for oats, but a mixture of grain with bran and oilcake, giving an increased protein supply, proved more effective than grain alone. Of all the grains tested millet gave the best results. Barley, when supplemented with protein concentrates, gave good results. Examination of the ejaculates showed that with increased protein supply the sperms were more numerous and of better quality, while there was also increased activity of the rams.

The work with stallions, which is described as a preliminary to further studies, gave similar results, millet again proving the best of the grains, especially when used along with oats and bran. Peas also were found to have a good influence. Of the meals used bran proved the best, up to 2·5 kgs. (5½ lb.) daily. Pasture was found to have a favourable influence on the activity of the stallion and on the quality of the sperms. For light-weight stallions of about 450–500 kgs. (990–1,100 lb.) live-weight a daily ration of about 6 kg. (13 lb.) starch equivalent, including 1–1·2 kg. of digestible protein was found to maintain the activity and live-weight of the animal throughout the breeding season, provided that not more than one service was given daily.

V.—UTILIZATION OF CARBOHYDRATES.

In view of the very large proportion of the animal's food that must of necessity be supplied in the form of carbohydrates it is surprising that so little attention is being given by agricultural investigators to the study of problems of carbohydrate supply. For our knowledge of the fundamental facts about the absorption and utilization of carbohydrates we are dependent almost entirely on the work of the biochemist and physiologist on the human subject or on small animals such as dogs and rats, eating rations in which the carbohydrates consist mainly of starches and sugars. In the case of the farm animal, and especially of the ruminant, the problem is far more difficult because of the variety of the materials that must, for practical convenience, be included under the term "carbohydrates." Some of these materials, indeed, especially in the case of coarse fodders, are not carbohydrates at all, so that the cautious analyst will usually designate the group either as "carbohydrates, etc.," or as "nitrogen-free extractives."

In so far as true carbohydrates (starches, sugars, etc.) are concerned there is no reason to think that their mode of digestion and assimilation proper is essentially different in the case of the farm animal from that of other species; but in the farm animal digestion is generally accompanied by a greater amount of bacterial fermentation. This fermentation reaches its maximum in the case of the ruminant, where it may exercise a profound effect upon the utilization of the whole food. It is to this fermentation, for example, that the ruminant owes its power of digesting cellulose and possibly other ingredients included in the "fibre" complex. Similarly this fermentation may greatly affect the efficiency of utilization of the starch, sugar and protein of the food.

Bearing in mind these complications, a few points of interest may be quoted from a recent review (Ref. 28) of the present state of knowledge on the fundamental processes of absorption and utilization of carbohydrates.

Carbohydrates have three primary functions in nutrition—(1) to furnish energy and heat; (2) to build glycogen as a reserve store of energy; and (3) to make fat. In addition, they are used to meet many other minor needs of the body. They take part in the synthesis of certain types of proteins and they function also in stimulating the production and flow of insulin, of intestinal juice, and possibly of bile. Some of them may exercise considerable influence upon the bacterial and other micro-flora of the intestines. Their influence in minimizing protein requirements is well known; less well known is their entrance into certain phases of mineral utilization.

Although the processes of digestion of carbohydrates begin in the mouth, it is doubtful whether any appreciable amount of the sugar formed reaches the blood until the food passes out of the stomach into the small intestine, where rapid absorption takes place, especially from the upper part of the intestine. This is not to say, however, that the stomach and its secretions exercise no influence on the absorption; they do exercise influence especially in regulating the rate at which the food mass is passed into the bowel. It seems probable that the different sugars are absorbed at different rates; those of the glucose group (except fructose) more rapidly than those of the sucrose group, while within the latter sucrose and maltose are removed more quickly than lactose.

Many factors, such as state of nutrition, age, sex, fevers, pregnancy, fatigue, activity and temperature, may influence the assimilation of carbohydrates. The proportion of sugar in the blood tends to vary with the rate of absorption, but in the normal subject the concentration is kept within relatively narrow limits by a regulatory mechanism; the level does, however, tend to vary somewhat according to the kind of carbohydrate fed.

In connection with the preferential utilization of various carbohydrates, the universal occurrence of lactose as the carbohydrate of milk is of interest. Some investigators suggest a correlation between lactose supply and brain development and point, in support, to the high lactose content of human milk. Others attach importance to its power, through the production of lactic acid, of maintaining a normal intestinal flora of non-putrefactive organisms. Evidence has also been obtained that by feeding lactose to young animals, calcium and phosphorus absorption from the intestine was increased—again, presumably, owing to increased lactic acid formation.

As regards the influence of different carbohydrates on growth, starch and dextrin proved, in experiments with rats, superior to different forms of sugar, an observation which accords with the well-known observations of Kellner and Fingerling on the relative merits of starch and sugars for cattle and pigs.

Other respiration studies have demonstrated marked variations in the ease with which the body burns various carbohydrates.

After the primary needs of the body for carbohydrates have been satisfied any further quantity absorbed must be either burnt and excreted, or stored up in the form first of glycogen and then of fat.

The ability of the body to store glycogen is very limited, so that if the excess of carbohydrates is considerable the greater part of such storage as is effected must be in the form of fat. This formation of fat from carbohydrate is indeed usually the main source of the fat laid down, whether in the fatty tissue or in milk or eggs.

VI.—MECHANICAL FACTORS IN NUTRITION.

It is perhaps natural that the scientific investigator of feeding problems should tend to concentrate a large amount of attention on the chemical nature of the food supply, and should thereby create the impression that he regards nutrition merely as a question of the supply, in proper proportions, of proteins, oils, carbohydrates, minerals, vitamins, etc. He is an ill-informed investigator, however, who is not aware of the age-long experience of the practical stock-feeder that a ration, to be satisfactory, must not only contain the necessary chemical nutrients but must also be suited in bulk and mechanical character to the internal digestive mechanism of the animal.

This point is adequately stressed in the text-books on the feeding of the farm animal, but in the rapid development of the scientific control of farm feeding during the present century there has been a tendency until recent years to overlook it. Particularly was this the case in connection with the rationing of dairy cows, where scientific control achieved its first and greatest success, and credit must be given to Boutflour for forcing upon the attention of agricultural advisers and farmers the practical importance of the " bulk " factor. In mechanical factors, such as that of bulk, lie undoubtedly the explanations of many of the apparent discrepancies between practical experience and the results of feeding experiments. Perhaps no better illustration of this can be given than the extraordinary diversity of opinion and experience about the nutritive merits of bran. The undoubted improvement obtained when bran is added to certain rations, despite the consequent lowering of the available nutritive energy of the ration, is certainly due in large measure to a change in the mechanical characteristics of the ration whereby it becomes better " suited " to the animal.

The physical character of a diet may be affected by a considerable number of factors, many of which contribute to the characteristic of bulk or bulkiness, by which we mean the space occupied by a definite weight of the material in the form in which it is usually fed. Thus hay and similar fodders are bulky because of their large content of fibrous material and open cellular and tubular structure. Among the " concentrated " foods also differences of bulk are largely, though not entirely, correlated with fibre content. The relative bulkiness of foods may vary also according as they are compared in the dry or wet condition. Oats and bran, for example, are similar in bulkiness in the dry state, but in the wet state bran is decidedly the more bulky, a fact that may, perhaps, account to some extent for the greater laxative effect of the bran. Other methods of preparation of food, such as flaking, may also have considerable effects upon its physical properties.

In the case of roots and similar succulent foods bulkiness is determined by their content of water, and the consequent turgidity of the cellular structure, rather than by fibre-content. The dry matter of roots indeed ranks as a relatively non-fibrous material. In some cases the beneficial effect of the feeding stuff may be associated not with bulk, but with a specific effect in counteracting constipation as, for instance, in the case of linseed cake.

Information of interest on this subject has recently been obtained in experiments at Glasnevin, reported by Sheehy (Ref. 29). In one series of experiments it was found that the addition of linseed cake to a ration of maize, barley and meat meals increased the appetite of pigs and improved the effect of the ration; but when 25 per cent. of bran was included in the basal ration no benefit accrued from the addition of linseed cake. The effect of the linseed in the former case was correlated with a change in the character of the fæces, particularly in the younger pigs, and the improvement of the ration was reflected in the greater uniformity of growth among the individual animals in the linseed cake group.

Oats, with a fibre-content approximating to that of linseed cake, failed to exert a like favourable influence.

A concentrated (low bulk) and costive ration, composed of maize, barley, meat meal and salt, which caused rapid fattening with little growth, was improved by the addition of bran, the optimum proportion of the latter lying apparently between 10 and 20 per cent. The inclusion of the bran gave a keener appetite, better health, more growth as distinct from fattening, and these changes were correlated with a greater bulk and softer consistency of the fæces.

The addition of carrageen moss or of liquid paraffin to a very concentrated diet caused pigs to be less restive and more satisfied than comparable animals on the same basal diet. Apparently the effect, though less pronounced, was similar to that produced by bran and linseed cake, and was concerned with the condition of the gut contents, particularly those of the lower part of the colon and rectum. It would appear, therefore, that a lubricant, such as liquid paraffin, enhances, at least temporarily, the value of a mechanically incorrect ration by preventing sluggishness of the lower gut.

Judged by its effect on the rate of live-weight increase, the nutritive value of a concentrated ration was not reduced by the addition thereto of ground oats up to 30 per cent. of the mixture. Apparently the reduction in the net energy value of the ration caused by the introduction of the oats must have been offset by an improvement in its physical character, which probably, in this case, was effective chiefly in the stomach. The addition of oats to a ration which already contained bran or linseed cake did not effect any improvement from the physical point of view, and under these conditions oats proved definitely inferior in nutritive value to maize.

The particular merit of green food in the dietary of the pig was found to be due partly to its vitamin A content and partly to its beneficial mechanical effect.

The "flaking" of grain confers on it, as far as digestion in the stomach is concerned, an advantage similar to that of adding fibre to a concentrated ration, but a diet excessively rich in flaky ingredients may prove so bulky as to cause inadequate food consumption.

Sheehy suggests that bulky foods should be divided into two classes, namely, (*a*) foods of the straw and dried grains type, and (*b*) succulent and lubricative foods, such as roots, green food and steeped bran. The mechanical effect of the former is chiefly concerned with stomach activity, while that of the latter is felt as much in the large intestine as in the stomach. Viewed in this manner the "bulk" factor clearly only affects stomach activity and may have little or no relation to effects produced further along the digestive tract.

The smooth functioning of the lower gut is essential for the promotion of good health, "bloom" and general well-being. An important criterion of good management is therefore the success with which optimum conditions are established in that organ, *i.e.*, conditions between the extremes of constipation and diarrhœa. The same care is also clearly necessary in comparative feeding experiments if a correct indication of relative nutritive values is to be obtained. Mere specification of a standard fibre content will not suffice to ensure this, since the effect on the alimentary canal of fibre from different sources varies; moreover, feeding stuffs may be present in the ration that have specific mechanical effects not associated with fibre.

VII.—Utilization of Grassland Produce.

The past year has seen a considerable development of practical interest in the artificial drying of young grass for use as a substitute for purchased concentrates, and grass driers have now been installed on many farms. We should not have long to wait, therefore, for the final elucidation of the economics of the process and of the extent to which dried grass can be effectively used in the dietary of high-producing live stock. Previous experimental work has left little doubt that, with suitable precautions in drying, a product can be obtained in which the nutritive value and "virtue" of the original grass are conserved to a higher degree than is possible by the alternative methods of hay-making or ensilage, and that, when used in moderate quantities, the nutritive value implied by the chemical composition of the dried grass can be actually realized in practice. Whether the heavy demands of the modern dairy cow can be met entirely by this kind of material, without detriment to the animal, remains to be tested in practice, as does also the question of the degree of variability in composition and nutritive value of dried grass that may have to be taken into account in the control of rationing.

Information on the latter point is available in a recent paper from Jealott's Hill (Ref. 30) which includes data for fresh and dried grass, hay, silage and various other types of fodder. In fourteen examples of dried grass the dry matter varied from

80·3 to 91·6 per cent., the digestibility of the organic matter from 69·1 to 84·1 per cent., the digestible protein equivalent from 5·9 to 16·7 per cent., and the calculated starch equivalent from 54·3 to 66·4 per cent. If variation of this order is likely to arise in farm grass-drying practice it would seem to make any close control of production rations of dried grass difficult if not impossible.

In another report from the same station (Ref. 31) the results are given of an experiment with two groups of ten cows each, in which the effect was tested of replacing part of the concentrates in a normal winter ration (of roots, hay and concentrates) by dried grass. The dried grass used had an estimated starch equivalent of 52·9 per cent., including 10·9 per cent. protein equivalent. Its quality "might have been better" but was "not far different from the average type of material which might come on the market." The average amount fed per cow daily was 8 lb. Neither the yield of milk nor its content of fat or non-fatty solids showed any change, but the carotene-content, and therefore the colour, of the butter fat showed a marked improvement on the grass diet, especially in the case of the Guernsey cows included in the groups. The condition of the cows remained generally good throughout the experiment, but they appeared to do better on the ration including dried grass, which showed a "significant" advantage over the ordinary winter ration in respect of live-weight increases.

How far cut grass can be dried by exposure in the field without losing appreciably in nutritive value is a question of obvious practical interest in relation to the economy of drying. On this point also observations have been made by the Jealott's Hill staff (Ref. 32). Samples were taken of grass cut in May and left in the field in each case for 54 hours in the form of (*a*) swaths as cut; (*b*) windrows made by raking four swaths together; and (*c*) heaps of 100 lb. fresh grass. Samples were taken at the time of cutting and at intervals of 6, 9, 24, 30, 48 and 54 hours thereafter. All the treatments were practically without effect on the yield of dry matter, total nitrogen and digestible nitrogen. The average carotene content was reduced by about 14 per cent. after 6 hours, and by about 22 per cent. after 54 hours in all treatments. The average percentage of water in the grass fell significantly up to 30 hours for the swaths, 48 hours for the windrows, and 24 hours for the heaps; but beyond these periods little or no further loss of water occurred. At these periods the original 75 per cent. of moisture had been reduced to averages of approximately 54, 58 and 70 per cent. respectively in the three forms of drying. Naturally, the extent of drying was in all cases greatest in the outer exposed layers. Further observations under different conditions of rainfall, temperature and crop are obviously desirable before any general conclusions can be drawn as to the feasibility of such preliminary drying in the field.

A point of scientific interest, and possibly at times of some practical importance, is the extent to which young grass, especially if heavily manured, may contain nitrogenous ingredients (*e.g.*, amides, ammonia and nitrates) which are non-protein in character, and which, if present in excessive amounts, may be liable to cause digestive disturbances in stock consuming the herbage. Recently published data (Ref. 33) on this point suggest that the proportion of the total nitrogen that is present in true protein form in "intensive" herbage, as grazed by stock, is normally more or less constant at a value between 80 and 90 per cent., and that only in exceptional circumstances does the non-protein nitrogen exceed 20 per cent. of the total nitrogen. Such exceptional circumstances doubtless arise, for example, on heavily manured grass under conditions of very rapid growth, or when, after heavy manuring followed by a check to growth, growth suddenly recommences. Such abnormalities are most likely to occur in the early and late weeks of the grazing season and are likely to be of very short duration.

Incidental to the question of grass feeding is that of the amount that the grazing cow actually consumes on the pasture. On this point American observations at Beltsville (Ref. 34) indicate that a cow will graze in a day about 6 per cent. of the grass standing on one acre, and that the limit of her capacity is about 150 lb. of grass per day, equivalent to 30–35 lb. of dry matter, depending on her size. This means that the pasture must be carrying 2,500 lb. or more of grass per acre to permit the cow to graze her fill. These figures are in substantial agreement with similar estimates made in this country.

The literature of the year contains many publications dealing with ensilage and a few with haymaking losses, but in the main these confirm previous observations and do not present any novel features that call for notice.

VIII.—LUCERNE.

A fourth and final report (Ref. 35) on the Cambridge lucerne studies gives information on the bearing of the leaf-to-stem ratio on the composition and estimated nutritive value of the produce.

That the leaves of grasses, clovers and forage crops generally tend to be more nutritious than the stems is familiar knowledge that underlies the efforts of the plant breeder to obtain strains with a maximum proportion of leaf at the stage of development at which the plant is to be harvested. This ratio will vary at the different stages of development of any one strain, and will change at different rates in different strains or species. In the case of lucerne the stem begins to assume a fibrous character at an earlier stage of development than is the case with most grasses, so that its nutritive character changes more rapidly with advancing age.

The Cambridge data bring out these changes very clearly and indicate that the change in the leaf-stem ratio is in fact the main cause of the decrease in protein-content, increase of fibre-content, and general reduction in nutritive value of the lucerne crop as it passes through the successive stages of growth up to flowering. The rate of decrease of leafiness is relatively rapid in the pre-budding stage and slows down between budding and flowering.

Later cuts of lucerne have a distinctly leafier character than the earlier cuts, whatever the stage of development of the plant at the time of cutting, which fact accounts for the higher protein content of the late-season cuts. Undue delay in taking the first cut is more detrimental than similar delay with later cuts.

Should a dried lucerne meal of high nutritive value, similar to lucerne *leaf* meal, be required, it is advised that this should be obtained by making lucerne-leaf meal proper from the foliage of the flowering crop rather than by cutting the lucerne frequently at the pre-budding stage. The latter method may show some little advantage in yield in the first year, but this is more than neutralized by deterioration in subsequent years. At all stages of growth the leaves are richer in protein, lime and phosphoric acid than the stems, and poorer in fibre and potash.

The Cambridge observations are closely confirmed by similar studies made in Czechoslovakia (Ref. 36) and in Italy (Ref. 37).

The real value of lucerne is only imperfectly expressed, however, by its content of digestible protein and minerals; more often than not—so far, at least, as the dried product is concerned—the main reason for its inclusion in rations is its presumed content of vitamins, especially vitamin A and, to a less degree, vitamins B and D. Owing to the identity of vitamin A with a form of the colouring matter carotene, it has been relatively easy to study the effect of various treatments of lucerne and other greenstuffs on the content of this vitamin, and many experiments have confirmed the tendency of the greenstuff to lose vitamin A from the time of cutting. The loss is apparently least when the greenstuff is dried rapidly by artificial heat and greatest under slow haymaking conditions. Quite apart from this the vitamin A content of the original crop may vary greatly according to its nature, stage of maturity, the conditions of its growth, etc., so that the vitamin-potency of the ultimate product must inevitably tend to show great variations. A warning as to this, with special reference to lucerne (alfalfa) meal, is given in a recent American report (Ref. 38); samples of the meal prepared in different ways showed a range of carotene content from 2·1 mg. to 58·1 mg. per 100 gm. of dry matter, the range in artificially dried samples being from 18·6 to 58·1 mg., and the losses varying from 26 to 70 per cent. of the carotene in the original material. Further loss also took place during storage, under ordinary commercial conditions, in the warmer periods of the year. The necessity for insistence upon a specific vitamin warranty in the purchase of alfalfa meals and similar products is thus obvious, and no dependence should be placed upon general statements of value.

A further American report (Ref. 39) deals with the subject of the two B vitamins, B1 and B2, in lucerne, clover and timothy hays. In all cases the product contained more B2 than B1, and the content of both vitamins fell off as the plants matured and the greenness of leaf and the leaf-stem ratio decreased. Unlike vitamin A, the B-vitamins did not suffer from exposure to weather for ninety-six hours, provided that no rain fell; but 0·68 inches of rain removed 50 per cent. of the vitamin B potency. Timothy and clover, cut early in the season, were about as potent as lucerne cut later.

IX.—CATTLE FEEDING.

Under this heading fall to be noted various experiments carried out at Auchincruive (Ref. 40).

Marrow-Stem Kale v. *Swedes.*

In one experiment with two lots, each of twelve "blue-grey" bullocks, a comparison was made of marrow-stem kale with swedes on the basis of approximately equal dry matter. The daily allowance of swedes ranged from 36 to 44 lb. per head, that of kale being about one-fifth less. From the trial the conclusion was drawn that, on the dry matter basis, marrow-stem kale, if used early in the winter and in the manner adopted, is quite as valuable as swedes in the production of beef.

Optimum Amount of Concentrates.

A second experiment dealt with the amount of concentrates for fattening cattle, again with two groups, each of twelve cattle. The treatment of the two groups was identical except that in one group the daily allowance of concentrates was increased by 2 lb. per head, giving a daily allowance per head to this group of 8–10½ lb. The average live-weight increases per day over a period of twelve weeks were 2·6 lb. for the lower, and 2·5 lb. for the higher allowance of concentrates, whilst the carcase percentages also showed no significant difference. The lower ration provided an average per day of 13·5 lb. starch equivalent, including 2·0 lb. protein equivalent, which, for an animal of 1,080 lb. live-weight, clearly covered the full fattening capacity of the animals. It is of interest to note that the extra

2 lb. of food consumed per day by the "high-feed" lot led to the consumption of about 7 lb. more water. Similar results were obtained in a second experiment carried out on the same general lines, but with slightly lower amounts of concentrates.

Dried Grass Meal.

A preliminary trial of dried grass meal as a concentrate is also referred to in the same report, the amounts used rising from 2½ to 3¾ lb., along with an equal amount of meal concentrates. It is reported that the grass meal was readily eaten, and appeared to exercise a favourable influence on "bloom."

A further experiment, in which the feeding merits of sprouted maize were tested, will be referred to in a later section (p. 318).

X.—SHEEP FEEDING.

The same report from Auchincruive also contains a summary of the results of three series of experiments in sheep feeding.

Varying Amounts of Protein.

In the first of these a comparison was made of rations supplying varying amounts of protein, but otherwise similar in nutritive value. In this test three groups, each of forty Border Leicester × Blackface hoggets, were used, each being enclosed in an area of approximately 1½ acres for twelve weeks, by which time the majority of the sheep were well finished. The daily rations per head consisted of 9–11 lb. swedes, ½ lb. hay, and ¾–1¼ lb. concentrates. The nature of the concentrate mixture varied in the three groups, and the average protein contents of the daily rations fed to the three groups were estimated at 0·24, 0·28, and 0·32 lb. respectively. Over the twelve-weeks period the average daily gains in live-weight were 0·20, 0·21 and 0·22 lb. respectively. The data given do not permit of any conclusion as to whether the slight differences indicated were really "significant," but they are regarded as "indicating the advisability of including a reasonable proportion of protein-rich foods in the mixture." The "low-protein" mixture of concentrates used consisted of one part each of decorticated groundnut meal, decorticated cottonseed meal, and dried distillery grains, along with two-and-a-half parts each of crushed oats and kibbled maize.

Sugar-Beet Tops v. *Swedes.*

A second experiment dealt with the value of sugar-beet tops for sheep in comparison with swedes. At first the tops were carted off and fed to the sheep on grass, but after a short time the tops were consumed by folding on the beet area. The produce of 4 acres of beet supplemented by concentrates at the rate of 1¼ lb. per head daily, and hay as required, provided feeding for a period of nine weeks for fifty-six hoggets of 80–90 lb. live-weight or 500 " sheep-weeks." This is regarded as equivalent to what might be expected from 1 acre of swedes yielding about 25 tons per acre.

Marrow-Stem Kale v. *Swedes.*

In a third experiment a comparison was made between swedes and marrow-stem kale with four groups, each of thirty-two hoggets, of average initial weight about 73 lb. Two groups were folded on the swedes and kale respectively, whilst for the other two food was cut and fed in troughs. In the latter case the amount of kale was rationed to supply the same amount of dry matter as was contained in the 10–12 lb. swedes fed per head daily to the other lot. As in the similar experiment with cattle, the results were much the same in all lots, the average daily live-weight increases ranging from 0·24 to 0·28 lb. The kale-fed lots killed a little better than the swede lots, especially the lot to which the kale was fed in cut form, and this method of feeding the kale is therefore recommended; it involves more labour but less waste, and enables more sheep to be fattened per acre.

Data on the general composition and digestibility of marrow-stem kale will be found in a later section (p. 316).

Composition of Ewe's Milk.

Under sheep feeding we may include a reference to information published from the Rowett Research Institute (Ref. 41) on the composition of ewe's milk, a matter on which very few British figures are available. Eight sets of samples of milk taken throughout the lactation periods from eight Cheviot ewes under normal grazing conditions showed the following percentage composition :—

	Average. Per cent.	Range. Per cent.
Total Solids	19·88	14·35–23·98
,, Protein	6·83	5·05– 9·91
,, Sugar	3·74	1·60 5·60
,, Fat	7·94	3·18–12·40
,, Ash	0·93	0·80– 1·11
,, CaO	0·276	0·22– 0·34
,, K_2O	0·152	0·11– 0·19
,, Na_2O	0·068	0·04– 0·09
,, P_2O_5	0·374	0·33– 0·44
,, C_2	0·118	0·10– 0·15

XI.—PIG FEEDING.

The pig lends itself so admirably to experimental work that it is not surprising that each year brings a considerable volume of reports on experimental studies of pig feeding and of various aspects of pig management associated with the economic utilization of food. Prominent amongst the problems of the latter type that are at present arousing interest is that of the influence of varying levels of food supply upon growth rates, carcass quality and economic returns.

Restricted Feeding.

Restriction of food supply may take either the direct form of reducing the weight of food supplied to the pig or the more indirect form of reducing the concentration of the diet by the inclusion of bulky or fibrous foods. The former method is mainly being studied in this country, whereas Continental reports deal chiefly with the latter.

Experiments at Cambridge, on which an interim report has been issued (Ref. 42), have so far shown a substantial improvement in economic returns and in carcase grading quality through limitation of food supply to the pig from 65 lb. live-weight onwards. In the experiment reported each pig was fed individually, and from 65 lb. to 100 lb. live-weight the allowance to the restricted pigs was three-quarters of what their unrestricted mates would consume in two feeds of half an-hour each. From 100 lb. onwards a further restriction down to two-thirds took place. Naturally the restricted pigs required longer to reach the standard baconer weight of 205 lb., the difference between individual pairs varying from seven to forty-nine days with an average of twenty-seven-and-a-quarter days. The differential feeding was also reflected in the conformation of the pigs, those on unrestricted diet tending to take on the typical fat, thick-set and jowly appearance of pork pigs, whilst the restricted pigs had the thinner, longer-legged, lighter-shouldered and lighter-jowled appearance of the typical baconer.

In a similar test on group feeding lines at Wye (Ref. 43), restriction produced a clearly-marked improvement in the case of Large White × Large Black pigs, but not in the case of Large White × Essex Saddleback pigs sired by the same boar. So far as concerns the effect of restricted feeding on the quality of carcase, this report stresses the primary importance of *type*, both of sire and dam.

Experiments on similar lines have also been conducted at Reading (Ref. 44) with Large White and Large × Middle White pigs, one set of pigs being fed at the level of Wood's standards, and the other in the first experiment at a 10 per cent. lower level, whilst in the second experiment the second group was also rationed in accordance with Wood's standards until the daily consumption per head reached 4·5 lb. of meal, at which level it was subsequently kept constant. In neither experiment was there any advantage from the restriction of feeding, apart from a slight improvement in the economy of utilization of food in the first experiment. In the second experiment, where the restriction was more drastic, the results were definitely adverse to restriction, and the opinion is expressed that restriction of the ration below 5 lb. daily is probably uneconomic. Data broadly confirmatory of this conclusion have also been obtained in experiments at Aberdeen (Ref. 45); also at Cornell University (Ref. 46) and at the Michigan Experiment Station (Ref. 47). In the last named experiment it was found that restricting the food below 3½ per cent. of the body-weight resulted in decreased economy of production, but it seems unlikely that so high a proportion of food is economic in the higher ranges of live-weight, except where pigs are being fed primarily for lard.

Further experimental work on this important economic point is clearly necessary before reliable guidance can be offered.

Bulky Foods.

The alternative system of restricting food supply by a lowering of concentration is illustrated by the frequent practice of leaving pigs after weaning to derive part of their food supply by grazing on pasture or green crop, but in this case complications arise through the factors of exposure, exercise, weather conditions, nature of crop, etc. It is only to be expected, therefore, that experience in the comparison of outdoor and indoor feeding will vary. Experiments at Harper Adams College, previously reported, gave results favourable to day pasturage in the summer and unfavourable in the winter. In similar comparisons at Wye (Ref. 48) the advantage lay with the pastured pigs both in summer and winter. In another experiment pigs on pasture receiving "balanced" meal supplements gave better results than those receiving a supplement consisting entirely of cereal meals, which finding suggests that even herbage containing a good proportion of clovers may fail to supply the full protein requirements of the growing pig.

A simpler measure of the effects of including greenstuff or other bulky food in the ration can be obtained under conditions of indoor feeding, and numerous observations of this character, especially in connection with the fattening of pigs on potatoes, are available in the Continental literature. The data are varied and difficult to summarize and refer, moreover, mainly to the feeding of pigs to heavy weights; in the main, however, the evidence for the range of weights up to 200 lb. live-weight is clear that, whereas the inclusion of green fodder or similar bulky food in the ration in moderate amount may frequently so improve the general health of the pigs (possibly due to vitamin supply) as to maintain or even improve the growth rate, the use of larger amounts almost invariably results in slower growth and fattening, owing to reduced consumption of other foods. Whether the use of green food or other bulky foods in relatively large proportions will be economic despite this slower growth must naturally depend on the circumstances of each individual case.

Provided the ration is adequately supplied with protein, minerals and vitamins, the addition of small proportions of greenstuff would seem to have little effect on growth rates. Such was found to be the case in Harper Adams experiments (Ref. 24) and also in Danish experiments with lucerne (Ref. 49), although in the latter the replacement of 8–12 per cent. of the concentrates by fresh lucerne was accompanied by an appreciable improvement in carcase quality. According to this Danish report young green lucerne appears to be better utilized, especially by younger pigs, than grass or other forage crops. It is unimportant whether it is fed whole or chopped, provided that it is cut early, fed fresh, and does not exceed 10 per cent. of the total ration.

Protein Supplements.

Another line of perennial interest in pig-feeding experimental work is the comparison of the various protein-rich feeds that may be used to supplement the basal ration of cereal meals, foremost amongst which supplements come milk and its various by-products. The use of whole milk in commercial pig-feeding can rarely be economic, but skimmed milk is rightly regarded as the ideal protein supplement, and other materials, such as fish meal, serve merely as substitutes for it. Reference has been made in a previous section to the fact that milk contains an excess of acids over bases, so that a small allowance of carbonate of lime should be added to it. Judged merely as a source of protein, an allowance of about 5 pints of skim milk daily will suffice to meet the normal needs of the growing pig for protein along with a full allowance of cereal meals; but rather more than this amount can be used with advantage if a cheap supply is available.

Dried Skim Milk.

Where liquid skim milk is not available, dried skim milk suggests itself as perhaps the best substitute, but whether this is equal in value to the liquid form seems open to doubt.

In an experiment at the Harper Adams College (Ref. 24), no advantage accrued from replacing soya meal by dried skim milk, whereas in an earlier experiment a similar replacement by liquid skim milk had improved the growth rate. Similarly, in a Scottish test (Ref. 50), dried skim milk did not compare favourably with skim milk (probably owing to lime or vitamin deficiency), and in an Austrian test (Ref. 51) replacement of a mixture of fish and meat meals by dried skim milk also caused a slight lowering of the growth rate.

Dried Whey.

Whey and dried whey fall into a different category, since, owing to the removal in the cheese of the greater part of the protein and part of the calcium and phosphorus of the milk, these products cannot be regarded as milk substitutes. A report from Reading gives the average composition of commercial dried whey as under: Moisture, 7·01 per cent.; Fat, 1·18 per cent.; Ash, 7·54 per cent.; Crude Protein, 12·50 per cent.; Sugar, acids, etc. (by difference), 71·77 per cent.

The ash contained chlorine equivalent to 2·28 per cent. common salt. The calcium content ranged from 0·46 to 0·83 per cent., whilst that of phosphorus varied from 0·37 to 0·83 per cent.; the calcium-phosphorus ratio ranged from 0·90 to 1·89. The product was distinctly acid, and showed an average acidity equivalent to 2·38 per cent. of lactic acid. Whey should thus be regarded as a food rich in carbohydrate and minerals, comparable, that is, with a mixture of cereal meals and minerals rather than with a protein concentrate. This view is confirmed by the results of a Scottish experiment (Ref. 50), in which the addition of 10 per cent. of whey paste (semi-dried whey) to the control ration did not affect either growth rate or food consumption.

Milk Substitutes.

Where skim milk is not available the most popular substitute is some other animal by-product rich in protein, fish meal being the most widely used, followed by other such products as meat meals and whale-meat meal. Practical opinion both here and on the Continent definitely inclines to the view that animal protein concentrates have a higher value, as a supplement to the basal cereals of pig rations, than those of vegetable origin, such as soya and groundnut meals, and there is much experimental evidence in support of this view, especially in its application to the earlier stages of growth. In the recent Scottish experimental work (Ref. 50), for example, the control ration, in which fish meal was used as the protein concentrate, almost invariably proved a little superior to the other rations in which extracted soya meal and extracted groundnut meal were used. (Incidentally, it proved superior also to meat-and-bone meal and to blood meal.) In some cases, however, the differences were too small to be regarded as statistically significant, and, moreover, there is much evidence from other experiments, and from practice, that under suitable conditions results equal to those obtainable with fish meal can be obtained with vegetable protein concentrates. This has been demonstrated previously at the Harper Adams Station, and confirmed again in a recent test (Ref. 24). What may be the conditions requisite for success with the vegetable protein concentrates cannot yet be defined, but they certainly include a closer attention to the supply of minerals (lime and salt) and vitamins than is usually necessary with fish meal. The observations in an earlier section (p. 297) on the influence of the details of manufacture on the biological value of soya bean protein have a bearing upon this point.

Milk Yield of Sows.

Further information on this important subject is available in a South African and a German report. The former (Ref. 52) gives data based upon fifty-two lactations of twenty-five Large Black sows, ranging from thirteen months to sixty-five months old at the time of farrowing. The milk yield was determined by weighing litters before and after suckling during a twenty-four-hour period once a week. The milk yield was found to rise gradually to a maximum in the third week, and to fall off thereafter, the average total milk-yield for an eight-week suckling period being 367 lb. Individual records varied from 185 lb. to 584 lb. Litter size affected total milk yield, and apart from this there were also marked individual differences between sows, some families showing superior milking capacity. The average weekly milk production rose from about 45 lb. in the first week to nearly 60 lb. in the third, and fell to about 30 lb. in the eighth week. The average amount of milk consumed per pound of live-weight produced, for the second to the fourth week inclusive, was 6·15 lb. Although the total milk yield increased with increase in litter size, the average amount available per pig decreased.

In the German tests (Ref. 53), with the same method of assessing the yield, the average daily milk productions of three Improved White ("Edelschwein") sows were found to be 7·3 lb., 14·6 lb. and 12·3 lb. respectively, the first sow being much smaller than the others. As in the South African tests, the yield reached its maximum in the third week, but from this point the subsequent decrease was only small.

XII.—INDIVIDUAL FEEDING STUFFS.

Kales.

A report from Cambridge (Ref. 54) gives information on the composition, digestibility and nutritive value of marrow-stem kale and thousand-head kale.

Unthinned marrow-stem kale showed an average dry-matter content of 13·3 per cent. in the autumn, rising to 14·2 per cent. in the following January. The average for thousand-head kale was rather higher (15·8 per cent.), but this was offset by a lower yield. Singling-out of the marrow-stem kale had little effect on the dry-matter content. In this case it was found that 55 per cent. of the total dry matter was in the leaves, 34·8 per cent. in the rind, and 10·2 per cent. in the marrow. The marrow was very watery, containing less than 10 per cent. of dry matter, more than half of which during October consisted of sugars, as did also the marrow of thousand-head kale.

The crude-protein content of unthinned marrow-stem kale in September averaged 16·2 per cent. of the dry matter, of which 12·25 per cent. was true protein. Slightly lower figures were obtained later in the season owing to loss of leaf. Singling of either form of kale did not appreciably affect the protein content.

The proportion of fibre in the marrow-stem kale was very constant in all samples and at all parts of the season, ranging in all samples from 17·9 to 18·6 per cent. of the total dry matter. The fibre content of the thousand-head kale was very similar.

Special interest attaches to the observation that the kales are relatively very rich in mineral matters, especially lime, chlorine, potash and sulphur. Satisfactory amounts of iron, magnesia and phosphorus are also present. The leaf is the part richest in lime and sulphur, while the marrow (on dry matter) is richer in phosphorus, potash, soda and magnesia.

Digestion trials showed both forms of kale to be very well digested by sheep, excelling in this respect green oats and vetches, flowering lucerne and medium meadow hay. During a relatively mild, open and rather wet winter, little or no change took place in the digestibility and feeding value of the crops. The starch equivalent, per 100 lb. of dry matter, was practically equal to that of average swedes, namely, about 65 per cent. Included in this, however, is about 9½ per cent. of "protein equivalent" as against 6 per cent. in the swedes..

Figures substantially in agreement with these from Cambridge are given in a German report (Ref. 54*a*) on three years' experiments with marrow-stem kale, in which also favourable effects of the kale on milk yield were recorded.

Potatoes.

The utilization of potatoes figures largely in pig-feeding experimental work on the Continent, where the common system of feeding is to give steamed or ensiled potatoes *ad lib.* along with a fixed daily allowance of 1–2 lb. per head of a concentrate meal rich in protein. That the method is capable of giving as good results with "strong stores" as ordinary meal feeding is confirmed by the results of Scottish tests (Ref. 50) on the same lines. Younger pigs, up to 70–100 lb. live-weight, do best on a rather less bulky diet.

In German experiments (Ref. 55) it was found that during the "preparatory fattening period," up to about 75 kg. (165 lb.)

live-weight, the total daily supply of digestible protein in the ration should be not less than 150 gms. If the basal ration consists entirely of materials poor in proteins, such as potatoes, potato flakes, or dried beet pulp, then the concentrate mixture itself should include 200 gm. of protein-concentrate food such as fish meal; or, alternatively, 3 litres (about 5 pints) of skim milk may be fed. In the final fattening period excellent live-weight gains were recorded with a daily allowance of 700 gm. (1½ lb.) of ground oats and 4 litres (7 pints) of skim milk, along with the potatoes.

Danish experiments (Ref. 56) show that the dry matter of ensiled cooked potatoes is equal in value to that of cooked potatoes, and is equally well utilized in quantities up to 40 per cent. of the ration. Feeding raw potatoes, even in small quantities, proved uneconomical. It produced thin backs, but the quality of the bacon was poor, partly because of the slow growth of the pigs.

The superiority of steamed over raw potatoes, as measured both by rate of growth and by economic returns, was also confirmed in a comparison at the Kirton Farm Institute (Ref. 57).

Contrary to the general opinion on the unwisdom of feeding large quantities of potatoes to in-pig and suckling sows, no adverse effect on either the fertility of the sows, the birth weight of the pigs, the mortality rate, or the weight at four weeks old was noted in a German test (Ref. 58), in which as much as 6–12 kg. (13–26 lb.) of potatoes per sow per day were fed.

Dried Sugar-Beet Pulp.

Experience in the use of this food for pigs has been somewhat varied, but there is general agreement as to its suitability, provided it be introduced gradually, starting with about 5 per cent. and rising to a maximum of 20–25 per cent. of the ration, beyond which point difficulties arise owing to the great increase in volume of the pulp on wetting. This general opinion finds confirmation in the results of tests made at the Norfolk Agricultural Station (Ref. 59).

In six trials the amount of food consumed per pound of live-weight increase was 3·92 lb. when pulp was included in the ration, and 3·90 lb. when omitted. Grading results were, if anything, slightly better on the pulp rations.

Sprouted Grain.

The faith of those who believe that grain acquires in the process of germination specific nutritive advantages over the unsprouted corn will receive some support from the preliminary report on a test with sprouted maize carried out at Auchincruive (Ref. 40). In this test one-third of the daily allowance of swedes to four bullocks was replaced by sprouted maize, supplying the same amount of dry matter (about 9 lb. maize to 20 lb. swedes). "The rate of increase in live-weight was at first phenomenal, being fully 4 lb. a day for the first four-week period, and averaging 3·1 lb. daily over the entire feeding period" (twelve weeks). It is further reported that the cattle on the sprouted maize ration showed superior bloom, their coats being fine and silky and showing no tendency for any hair to come off. The improvement extended also to the quality of the carcase. A second experiment on the same lines in progress at the time of the report would appear to be confirming the previous results, and the final report promises therefore to be of considerable interest.

A different issue is under examination at the University of Nebraska, where the effect of sprouted oats on reproduction in dairy cattle is being studied (Ref. 60). Some observers have reported favourable results from feeding sprouted oats to cows that did not readily conceive, but in the Nebraska tests, which have been in progress since 1931, there is no evidence of any marked effect upon the reproductive functions of either heifers, cows or bulls as measured by the number of services required for conception. The same conclusion with reference to cows and sows is also reached in another American report (Ref. 61).

Cacao Shell.

The discovery that this by-product of the cocoa industry is rich in vitamin D (Ref. 62) has revived interest in its possibilities as a feeding-stuff for farm live stock. The sample originally tested was of West African (Gold Coast) origin and contained 28 International Units (I.U.) of vitamin D per gram; this figure has subsequently been found to be fairly constant for this product (Ref. 63). The fresh cacao beans apparently do not contain any vitamin D, but it is present in large amounts after they have been prepared for market by fermentation and sun-drying; very little is present after sun-drying alone, which suggests that the vitamin is formed from the ergosterol of the yeasts growing on the shells during fermentation.

Tests with dairy cows at Reading (Ref. 64), using cacao shell containing 35 I.U. of vitamin D per gm., showed that, during winter feeding indoors, the addition of 2 lb. of cacao shell daily per head to the diet of Shorthorn cows over a period of one month increased the vitamin-D potency of butter made from the milk to 2½–3 times its original value, or about that of summer butter.

The foregoing English observations have been confirmed by similar tests in Germany (Ref. 65), in which even higher vitamin values were obtained, ranging mainly from 31 to 63

I.U. of vitamin D per gm. The samples tested came from Brazil, Ecuador and the Gold Coast, but apparently the origin of the beans has little or no influence on the vitamin-D content of the fermented shell, the variation being due primarily to the variable conditions of sun-drying and fermentation. The roasting that the beans undergo after drying was found to cause only a slight reduction in vitamin potency, which could be fully restored by ultra-violet irradiation.

Another German report (Ref. 66) gives data on the amount and digestibility of the protein of cacao shells. Eight samples were found to have a crude-protein content ranging from 15·1–17·6 per cent.; a ninth sample (from the Cameroons) contained 26 per cent. Artificial digestion with pepsin gave digestibility co-efficients of 40–55 per cent. for the crude protein, and 51–85 per cent. for true protein. Trials with a sheep gave digestibility co-efficients of 41·7–44·5 per cent. for the crude protein. Roasting the shells at 90° or 130°C. had very little influence on the digestibility of the protein. These results are in very striking contrast to the 4 per cent. digestibility given by Kellner and, if reliable, compel an entirely new assessment of the nutritive value of this product. The effect of the revision on the starch equivalent is to raise Kellner's figure of 34 per cent. to 42 per cent., which places cocoa shell meal—vitamin value and other specific properties apart—on a level with wheat bran. German experience indicates that it may safely be fed to cows and fattening cattle up to 5 lb. per 1,000 lb. live-weight daily, especially along with molasses, and that it can also be safely used in moderate amounts in pig feeding.

Oat Hulls.

In the preparation of oatmeal, and of oat kernels or groats, the paleæ, or hulls, are removed and form a by-product which must not be confused with the oat chaff that is separated out in thrashing. Oat hulls contain usually only about 4 per cent. of crude protein along with 45–50 per cent. of "soluble carbohydrates" and 25–30 per cent. of fibre, and are commonly regarded as having little more than "ballast value" for feeding purposes. Recent Irish tests (Ref. 67) suggest, however, that they may have a value intermediate between that of good oat straw and good meadow hay. In these tests calves that received white oat hulls from eight months old to thirteen months old did almost as well as similar calves getting good meadow hay. On the basis of the experimental data eleven pounds of oat hulls appeared to be equal to eight pounds of hay of the quality used. It is recommended that oat hulls be fed to cattle in a mixture with steeped sugar-beet pulp. It is claimed that such a mixture, supplemented with protein and minerals, "provides for satisfactory progress" even in the case of young cattle.

Meat Meals.

Meat meals and meat-and-bone meals are widely used as protein supplements in pig and poultry feeds and usually give good results. They suffer, however, from the disadvantages of being made from widely varying raw materials, both as to the nature of the "meat" used and the proportion of bone included, and also of being prepared by different processes which may have variable effects upon the nutritive value of the product. Meal prepared from pure, dried, lean meat will contain up to 85 per cent. of protein, whereas a pure dry "degreased" bone meal will contain only 30–35 per cent. of protein. Between these two extremes lie the whole range of commercial meat meals and meat-and-bone meals, which are all mixtures of meat and bone in varying proportions, but need only be described as "meat-and-bone meals" if the percentage of protein falls below 55 per cent. A further complication lies in the fact that the protein of bone is inferior in amino-acid make-up, and therefore in biological value, to that of lean meat.

That dried meat products of different descriptions may vary considerably in protein-supplementing value has been repeatedly shown in American experiments and is confirmed once more by recent Danish tests (Ref. 68).

Meal obtained by heating under pressure was found to have lost considerable amounts of protein. The best results were obtained by the extraction process, in which the bulk of the fat is removed by treatment with a fat solvent. At its best this process, with a mixed meat-and-bone material, gave a product with 60–70 per cent. of crude protein, of which 80 per cent. was digestible true protein. The mineral (ash) content varied from 15–25 per cent. and the fat from 2–6 per cent. The "dry rendering" method involves difficulties with fat removal, and commonly leaves a product containing 10–15 per cent. of fat, and therefore not of high quality for the purpose for which meat meals are chiefly used.

That properly prepared meat-and-bone meals can give excellent results is illustrated in the Danish report by particulars of a test in which a meal, made by the extraction method from slaughterhouse and shop refuse and containing 35–40 per cent. digestible true protein along with 2–6 per cent. fat, was fed to pigs along with mixed cereals. The growth results were as good as those given by yeast, herring meal, dried skimmed milk or malt, and the quality and flavour of the carcases were excellent.

One further American example (Ref. 69) of the variable value of meat products, in this case as tested by chicken-rearing experiments, may be quoted. Materials described as "tankages" gave decidedly inferior results, " meat scraps " and " cracklings " were much better, but still unsatisfactory, while " vacuum-dried " beef and whale-meat meal gave very satisfactory results.

The general impression from experimental work on meat meals is that the purchase of these products is a rather speculative transaction unless some information can be obtained on the nature of the product and mode of manufacture.

Herring Meal.

The difficulties of the herring fishing industry and the increased national need for making use of home-produced feeding materials have combined to reopen the question as to how far fish products of various kinds can be used in the feeding of farm live stock without imparting a fishy taint to the produce. The older experimental work, combined with the necessity for taking into account the risks of careless handling on the farm, led to the practical compromise embodied in the advice generally given that only " white fish " meal should be used, and in proportions that should only in exceptional cases exceed 10 per cent.

Popular opinion, and to some extent evidence from experiments, support the view that the risk of taint is partly associated with the proportion of oil in the meal, and for this reason it is usual to advise the avoidance of meals rich in oil. This is not to say, however, that, where proper care is exercised to keep the use of the meal within the 10 per cent. limit, it may not be possible to use meals richer in oil, and as strongly flavoured as the herring meal, without detriment to the product.

There is, indeed, an abundance of evidence from experiment that this is practicable. To quote only from the literature of the past year, co-operative pig-feeding experiments at six centres in Germany (Ref. 70) indicated that fish meal containing 10–12 per cent. of oil could be fed at the rate of 250 gm. (roughly, ½ lb.) per head daily without any adverse effect upon the appearance, consistency, odour or flavour of the bacon and ham, although certainly in most cases the livers when cooked showed a fishy taint. The same experience was reported when herring meal rich in oil was used, even after prolonged storage. Incidentally, the experiments also showed a definite superiority of herring protein over vegetable protein in its effect upon the rate of growth, meal rich in oil giving a rather higher growth-rate than meal poor in oil. In these tests herring meal was fed in various amounts and for varying periods of time and after various periods of storage without producing any taint beyond that in the livers, which increased in intensity with increased supplies of herring meal. This taint did not appear when the use of fish meal had been stopped six weeks before slaughter.

Similar results are reported from Dutch pig-feeding experiments (Ref. 71), in which also an appetite-stimulating advantage is claimed for the herring meal in comparison with meat meal and blood meal. Certainly in this case the "iodine value" of the fat appeared to be increased a little by feeding herring meal (and meat meal) rich in fat, and it is advised that the use of herring meal should stop about a month before slaughter.

In another German test (Ref. 72) herring meal gave as good growth rates with pigs as cod meal, and definitely better than soya meal and dried yeast. A high salt-content did not prove detrimental. Trials of herring meal with pregnant and suckling sows were entirely satisfactory.

In Scandinavia, herring meal has also been fed to milch cows in considerable proportions without causing any taint in milk or butter.

It seems clear, therefore, that under carefully controlled conditions, such as obtain in experimental work, the risk of taint with herring meal is small, and probably less than has hitherto been assumed. It is equally certain, however, that gross carelessness in its use may easily lead to trouble, and it is the practical difficulty of devising adequate safeguards against such abuse that would constitute the real danger of any relaxation of the present guarded attitude of the agricultural adviser and bacon curer towards the use of oily and strongly flavoured fish meals.

Linseed Poisoning.

The popularity of linseed cake lends interest to the evidence that has been accumulated in recent years of the possibility of poisoning stock by its use in moistened form; the risk is due to the presence in the cake of a glucoside which, under moist and warm conditions, is capable of liberating hydrocyanic (prussic) acid. The glucoside is almost invariably present, but usually in such small proportion as not to constitute any serious danger. It is obviously of interest, however, to know just where the point of danger lies, and how frequently this is liable to be exceeded in different consignments of linseed and linseed cake.

On the question of the minimum toxic doses of hydrocyanic acid for farm animals, experiments have been made by Tocher at Aberdeen (Ref. 12). Two pounds of a linseed cake, capable of liberating 2·8 grains of prussic acid, had no effect on a pig. Direct administration of 2·5 grains of the acid proved equally innocuous, but when the dose was increased to 6·16 grains, administered immediately after a meal, the pig died within half an hour. The same result was obtained when a similar dose of the acid was administered in the form of potassium cyanide in capsules, although a much larger dose, mixed with the pig's food before consumption, had no ill effects.

The quantity of 6 grains of prussic acid is usually contained in about 4½ lb. of linseed cake, a quantity that would not be fed to a pig.

In further tests with young cattle, weighing 4 to 4½ cwt. and feeding on turnips and straw, quantities of linseed cake equivalent to 1–8 grains of prussic acid were fed daily for a month, along with maize, without producing ill effects. Direct administration of prussic acid as potassium cyanide in quantities up to 12 grains of the acid proved equally harmless. From these tests the conclusion is drawn that " even 3½ lb. of linseed cake, containing the highest proportion of prussic acid yet found, can have no ill effect on cattle if fed daily in a ration."

Castor Seed Poisoning.

The much-debated question of the risks arising from the presence of small proportions of castor seed in feeding-stuffs has also been the subject of experiments which are summarized in the same report.

Pigs of 60 to 70 lb. live-weight consumed up to 20 castor seeds daily, mixed with maize, without ill effect. After eating 22 gm. of ground castor seed mixed with 1·5 lb. of msize the pig scoured for three days, but recovered on the fourth day. When 1·5 lb. of maize containing 3·5 oz. (100 gm.) of castor seed was fed, the pig developed violent diarrhœa on the following day and died two days after having consumed its ration.

In similar experiments with young cattle fed with maize containing increasing proportions of castor seed, no ill effects were found until the amount of castor reached 24 gm., or 2·6 per cent., when scouring took place for three days, with recovery on the fourth. When quantities up to 2 oz. of whole castor seed were fed in the ration for two days, all the animals suffered from scouring and refused to eat the ration. There is some evidence, however, that the continued use of these particular animals for the tests had by this time given them a degree of immunity, and that animals unaccustomed to castor might have reacted more violently to the larger doses tried.

Fineness of Grinding of Cereals.

A closing reference may be made to Danish tests (Ref. 73) on the influence of fineness of grinding of barley and maize for pigs. The three grists compared showed, respectively, 80 per cent., 50 per cent. and 20 per cent. passing through a 1 mm. sieve. With maize, the feeding value increased appreciably with increasing fineness, whilst with barley the best result was obtained at medium fineness. There was no significant difference between wet and dry feeding.

CHARLES CROWTHER.

Harper Adams Agricultural College,
Newport, Shropshire.

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SOILS AND FERTILIZERS.

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The interest in agriculture that is so marked a feature of recent years continues to develop, and discussion centres mainly round three aspects: agriculture as a possible means of absorbing the superfluous labour of the towns; agriculture in relation to national nutrition; and agriculture as a factor in national defence. There are signs that farmers realize that prospects are improving, as, for instance, an increased consumption of fertilizers and a cessation of the laying down of arable land to grass. On the other hand, the invasion of the towns still continues; between 1933 and 1934 the area of land in England and Wales lost to agriculture was 67,000 acres. The total corn area increased in 1934; wheat and barley each went up by about 100,000 acres, while oats fell by about the same amount, so that the net gain for all corn was 110,000 acres. Sugar beet increased to a new record; vegetables and fruits increased, though potatoes, brussels sprouts and cauliflowers decreased, these two latter decreases being offset by gains in other vegetables. Cattle, pigs and poultry numbers increased, as also did the production of milk and eggs, but the number of sheep decreased. The total value of the output was higher than for the two preceding years and was close up to that of 1930–31. As compared with the period 1924–28, the consumption of food in the United Kingdom has greatly increased, and British farmers have played an increasing part in producing this extra food. The supplies of food in the United Kingdom have been, in thousands of metric tons :—

	Average per annum, 1924–1928.				1934.			
	Home produced.	Imported	Total.	Percentage produced at home.	Home produced.	Imported	Total.	Percentage produced at home.
Total meat (including poultry and rabbits) .	1,234	1,498	2,732	45·2	1,445	1,606	3,051	47·4
Bacon and Ham	75	447	522	14·4	104	438	542	19·2
Butter . .	44	282	326	13·5	57	485	542	10·5
Cheese . .	42	149	191	22·0	75	150	225	33·3
Eggs . .	156	156	312	50·0	279	170	449	62·1
Wheat flour* .	711	3,348	4,059	17·5	660	3,560	4,220	15·6

*Including wheat in terms of flour.

Only for wheat and butter has the proportion of home-grown food fallen: for all others it has risen.

All this additional output has been obtained with less labour, so that the efficiency of the workers is obviously increasing. The full data for the whole country are given in Ministry of Agriculture Statistics for 1934 (Ref. 1), but a full and interesting survey of the position in the Eastern Counties is made by the

Cambridge School of Agriculture, which gives some excellent examples of the nature of the various changes (Ref. 2).

The main facts in regard to national nutrition have recently been assembled by Sir John Orr (Ref. 3).

The annual consumption of food per head of population in Great Britain is :—

ANNUAL CONSUMPTION OF FOODS, POUNDS PER HEAD OF POPULATION IN GREAT BRITAIN.

Period.	Wheat flour.	Potatoes.	Meat.	Sugar.	Butter.	Cheese.	Margarine.	Vegetables.	Fruit.	Eggs (number).	Fresh milk (gallons).
1909–13	211	208	135	79	16	7	6	60	61	104	19·5
1924–28	198	194	134	87	16	9	12	78	91	120	20
1934	197	210	143	94	25	10	8	93	115	152	18

The consumption of wheat is falling slightly; that of potatoes and fresh milk remains about steady, but consumption of other foods is increasing, notably that of fruit, vegetables, eggs, butter and sugar and, to a less extent, meat. The increases are very clear if one puts the values for 1909–13 at 100; they become :—

Period.	Wheat flour.	Potatoes.	Meat.	Sugar.	Butter.	Cheese.	Margarine.	Vegetables.	Fruit.	Eggs.
1924–28	94	93	99	110	100	128	200	130	149	115
1934	93	101	106	119	157	143	133	164	188	146

The agricultural interest of Sir John Orr's report lies in the fact that these average amounts consumed are so unevenly spread over the whole population.

The consumption of bread and potatoes was found to be practically the same in all groups of the community, but the consumption of milk, eggs, fruit, vegetables, meat and fish rose with the income. For example, in the poorest group the average consumption of milk and eggs per head per week was—milk, 1·8 pints; butter, under 3 ozs.; eggs, 1·5; while in the richest group the figures rose to—milk, 5·5 pints; eggs, 4·5; butter, 11 ozs. or over per head per week. The poorest group spent 2½d. per head per week on fruit, and the richest *1s. 8d.* A detailed analysis of the diets indicated that the average diet of the poorer group, which included some 4·5 million people, was deficient in every food constituent examined. For the second group of about nine million people the diet was adequate in protein, fat and carbohydrate, but deficient in all the vitamins and mineral elements. The diet of the third group, including roughly a further nine million people, was deficient in some vitamins and mineral elements.

The fourth, fifth and sixth groups had a much better diet which approached or surpassed the standard of adequacy in relation to all the foods examined. Sir John Orr suggests that a diet sufficient to maintain perfect health is obtained by not more than half the population of Great Britain.

Now the important "protective" foods—milk, eggs, vegetables, fruits and meat—can be produced in abundance by English farmers, and whatever quantities are deemed necessary for the national dietary can be supplied. Moreover, meeting an increase in consumption involves no disturbance of overseas trade or Empire agreements.

The figures for the consumption of wheat are interesting because they bring out the important fact that while an increase in the standard of living up to a certain point raises the consumption of wheat, a fall sets in when the standard rises still further. The peoples that live well—the inhabitants of Great Britain, Canada, Australia and the United States—consume about 6 bushels per head per year of wheat (Canada slightly more, the United States somewhat less); in all these countries the tendency is to reduce the consumption, as increased amounts of other foods can be afforded. On the other hand, in countries with a much lower standard of living, wheat consumption is rising. In Russia the amount consumed per head was, before the War, about 3½ bushels, whereas now it has risen to 4. In Poland it was 1½ and is now about 2. But in great parts of Asia, *e.g.*, India, Japan, China, and in large tracts of South America and Africa, the consumption is much less. It appears, therefore, that the future hope for wheat growers lies in the countries that have hitherto eaten little wheat, rather than in those that have already reached the 5 and 6 bushel level. The valuable reports of the Food Research Institute (Ref. 4) shows that consumption was less than production for the years 1926 to 1934, with the result that stocks accumulated; but during the last two years production has fallen below consumption, so that, in spite of the great increases in wheat production in some of the European countries, stocks are being drawn upon.

The Washington Bureau of Agricultural Economics reported on July 1st, 1936, that the world's wheat supply was then the smallest for nine years, the surplus of the wheat exporting countries being only 388 million bushels compared with 532 million bushels in July, 1935. The world "carry over" had been reduced to 635 million bushels and there was a prospect of deterioration in the spring wheat crop of the United States.

FERTILIZER CONSUMPTION.

The farmers of England and Wales used more nitrogen in 1934–35 than in any previous year except 1931–32 and 1932–33. As before, most of the nitrogen was applied in the form of sulphate of ammonia. Irish farmers also used more than usual, but the farmers of Scotland used much less than in a good many previous years. Worked out as pure nitrogen the agricultural consumption for the British Isles was 56,900 metric tons. Expressed in English tons the figures for the most important nitrogenous fertilizers were :—

	English tons sulphate of ammonia used for agriculture in				Nitrate of soda.
	England and Wales.	Scotland.	Ireland.	Total.	
1932–33 .	150,704	51,570	36,369	238,643	20,000
1933–34 .	129,532	47,944	33,246	210,722	22,000
1934–35 .	133,384	43,309	34,450	211,143	26,000

Taking the world all over, the agricultural consumption of nitrogen was higher than ever before, the increase being particularly marked in Germany, Russia, Italy, Japan and the United States. As against this there was a great decrease in France. The total world consumption, for agricultural purposes, of all forms of nitrogen was 1·8 million tons ; the British Isles therefore used just over 3 per cent. of the total consumption.

The steady increase in nitrogen consumption by farmers in the British Isles, including the Irish Free State, is shown by the following figures :—

Average	Thousand metric tons of nitrogen.		
	As sulphate of ammonia.	All other fertilizers.	Total.
1924/5–26/7 . .	34·3	7·4	41·6
1927/8–30/1 . .	36·8	9·7	46·5
1931/2–34/5 . .	46·2	10·4	56·6

These figures, though high, are lower than those of some other countries. They are brought down by the low consumption in the Irish Free State, and they take no account of the large amount of organic nitrogen coming from imported feeding stuffs and finding its way into the farmyard manure. If this were included, the figure for the total consumption of nitrogen would, of course, be considerably higher.

The consumption of phosphate, both as superphosphate and as slag, also increased. For the world the consumption was

12·6 million tons in 1934. The figures showing the consumption in the United Kingdom are, in English tons :—

	Basic slag (Ref. 5).			Superphosphate (Ref. 6).		
	1932-3	1933-4	1934-5	1932	1933	1934
British .	162,407	230,019	280,423	532,130	494,174	533,715
Foreign .	4,215	41	—	53,189	65,275	33,379
Total .	166,622	230,060	280,423	585,319	559,449	567,094

The large amount of basic slag used in Britain reflects, of course, the importance of steel production. Many other countries use less than we do; indeed the estimates for the world in 1933 were (Ref. 7) :—

	Per cent. of total phosphoric acid as fertilizer.
Superphosphate	69
Slag	17
Ground mineral phosphate	7
Prepared mineral phosphate (Rhenania, etc.) .	3
Guano and bones (chiefly bones)	4
	100

The production of superphosphate has in recent years greatly increased in Russia, where in 1934 it amounted to 889·8 thousand tons and the consumption to 864 thousand tons. Production also increased in Denmark and Holland, but it has much decreased in France.

The consumption of potash has also increased.

There is, however, in all countries, a tendency to increase the consumption of nitrogen and of potash more than that of phosphate. World consumption of nitrogen is now back to the high level of 1929, before the last crisis, while that of potash is not far behind; but so far as one can judge from the available figures (Ref. 8), the consumption of phosphate, though increasing, has not yet caught up its old position.

The relative quantities of the three fertilizers consumed in Great Britain and Ireland is—

Nitrogen.	Phosphoric Acid (P_2O_5).	Potash (K_2O).
1	2·5	0·7

whereas the figures used to be more like

1	4	1

The German figures show a much smaller use of phosphate; the consumption of the various plant foods has been, according to Lemmermann (Ref. 9) :—

	Thousand metric tons.			
	Nitrogen (N).	Phosphoric acid (P_2O_5).	Potash (K_2O).	Proportion. $N : P_2O_5 : K_2O$.
1913–14 .	185	555	490	1 : 3 : 2·5
1930–31 .	355	474	668	1 : 1·3 : 1·9
1931–32 .	325	395	560	1 : 1·2 : 1·7
1933–34 .	382	460	718	1 : 1·2 : 1·9

Lemmermann contrasts this with the amounts of the three substances removed in various crops which is usually about 1 : 0·5 : 1 or more, which figures suggest that the proportion of phosphoric acid given as fertilizer could fall lower without serious result. This, however, would be a very unsound deduction, for it is well known that crops which remove least phosphoric acid from the soil, *e.g.*, swedes and potatoes, generally respond best to it. It was shown long ago at Rothamsted that no information about manuring can be got from the composition of the crop.

It is not known how far the addition of fertilizers counterbalance the losses of plant nutrients due to crop growth, leaching, erosion and other causes, but in most cultivated countries they do not completely do so, and the present generation must be regarded as wasteful exploiters of the world's natural resources. J. G. Lipman and A. B. Conybeare (Ref. 10) have worked out an annual balance sheet of plant nutrients in the United States, showing vast annual losses even after allowing for material brought down in rain or fixed by the action of micro-organisms. The final figures are, in millions of tons :—

ANNUAL BALANCE OF PLANT NUTRIENTS IN SOILS OF THE UNITED STATES, 1930.

	Million tons.					
	N	P	K	Ca	Mg	S
Losses (Harvested Crops, Grazing, Erosion, Leaching)	22·9	4·2	50·1	68·2	24·6	12·0
Additions (Fertilizers and Liming Materials, Manures and Bedding, Rainfall, Irrigation Waters, Seeds, and Nitrogen Fixed) .	16·3	1·4	5·2	12·6	4·0	9·0
Net Annual Loss . . .	6·6	2·8	44·9	55·6	20·5	3·0

The acreages over which these losses are spread are in millions :—

	Million acres.
Crop land	413·2
Pastures in farms	464·2
Pastures not in farms	578·0
Total	1,455·4

The remaining 450 million acres includes towns, forests, deserts and other non-agricultural land. Figures of estimated losses are not available for other countries but they would probably be found to be very high.

DISTRIBUTION OF FERTILIZERS IN THE SOIL.

Ever since artificial manures came into use there has been much discussion as to the best way of applying them to the soil. The usual way has been to broadcast them, in which case the only difficulty has been to ensure even distribution, which is, however, even now, not too easy (Ref. 11). During the last ten years much work has been done in the United States and Canada on the best position to place the fertilizer—whether with the seed, above it, below it, or at the side. Some marked differences are recorded according to the way this is done. In previous reports Canadian results have been quoted showing that for wheat on the Western prairies superphosphate drilled with the seed gave good returns, whilst if simply broadcasted before sowing it gave little or nothing. In Coe's experiments (Ref. 12), maize responded best when the fertilizer was sown in narrow strips alongside the seed, the relative yields being :—

No manure	100
Fertilizer 1 inch above seed . . .	100
„ 1 „ below seed . . .	130
„ 1 „ at one side of the seed .	170
„ 1 „ each side of the seed . .	162

Two Russian workers, Sabinin and Minina (Ref. 13), working with maize, have tried the effect of putting the fertilizer not in strips but in little pockets in the soil, and they obtained some remarkable results :—

	Weight of leaves and stem.		Weight of ears.	
	Fertilizer broadcast.	Fertilizer in pockets.	Fertilizer broadcast.	Fertilizer in pocket.
No manure . . .	100	100	100	100
Complete fertilizers.				
Half dressing . .	123	186	129	139
Full dressing . .	121	192	119	149

This way of placing the fertilizer caused neither luxuriant root development nor root injury in the neighbourhood of the pocket; on the contrary, the roots grew through the pocket without altering their direction. The little bunch that found its way through the pocket was able to take up enough plant food to supply the entire plant. The amounts of plant nutrients (nitrogen and phosphorus) taken up were less by the pocket arrangement than by broadcasting; but more found its way into the seed and less remained in the stem and leaves. This pocket distribution not only raised yields and increased the efficiency of the fertilizer but also modified the character of the crop.

J. A. McMillan and F. Hanley (Ref. 14) report tests with various crops in the Eastern counties. As for wheat in Canada, fertilizer drilled with the barley seed gave better results than when broadcast, the increase ranging from 1–3 cwt. (2–6 bushels) per acre. The yields of barley were :—

	Grain, cwt. per acre.			
	1933	1933	1934	1935
Fertilizer drilled . .	26·7	18·2	16·8	11·3
„ broadcast .	23·7	15·4	15·5	9·0
No manure . . .	21·5	13·8	13·1	7·3
Standard error . .	0·87	0·47	0·73	0·99

The remarkable result was obtained that drilling the fertilizer with the seed repressed the attacks of wireworm, so that in the part of the field where wireworms were plentiful the effect was very striking :—

	Grain, cwt.	Straw, cwt.
Fertilizer drilled with seed .	12·4	14·7
„ broadcast . .	4·1	6·7
No fertilizers . . .	1·3	3·4

On the other hand, no advantage was obtained for sugar beet.

The subject, however, is still in the experimental stage and until the research stations have proceeded much further with it farmers will be well advised to continue with the ordinary way of drilling.

Experiments on the subject have been started at Rothamsted and further information will be available later.

The condition of the material also affects the ease of distribution. Special attention is paid to this point in the making of modern chemical manures, but it is also important for lime. J. Hudig (Ref. 15) found that evenness of particle size and moisture content of the lime were both important factors in securing even distribution ; finely ground lime was better with a low water content and coarse lime with a somewhat higher water content.

CULTIVATION.

Experimental work on cultivation has not usually given very striking results, and there is no very clear evidence that the crop gains anything from work beyond what is necessary for keeping down weeds. This was the conclusion reached from experiments at Rothamsted and in California, and it has been confirmed in N.E. India by H. R. Cooper, in experiments on tea growing at the Tocklai Experiment Station (Ref. 16).

It is easy to be misled by the first appearance of the crop ; the real criterion is the final yield. Repeatedly it has happened that an improvement immediately following a cultivation has disappeared during growth, and that there has been no increase in the final crop. Experimental work is necessarily slow, but so far it has led to no definite results. Gyrotilling, for example, effects a deep cultivation, breaking up the subsoil to a very friable mass; one's first impression is that, for crops like potatoes and sugar beet, it must be an admirable thing and, indeed, some farmers state definitely that it is. But there seem to be no actual figures to show that the final yields are increased. The subject of cultivation is under investigation; meanwhile information is being collected about costs, and if it should appear that rotary cultivation is as effective as the older type, and is cheaper, there will be an obvious advantage in using it (Ref. 17).

The Rothamsted experiments have been quoted in an earlier Report[1]; Cambridge results have been assembled by Dr. H. G. Sanders (Ref. 18) in a paper read to the Farmers' Club. Although a number of experiments were made, it only rarely happened that the cultivation had any significant effect; the small differences observed could equally well be attributed to variations in the land. Two sets of results only need be quoted (see opposite page).

In Continental experiments continued over a period of seven years, ploughing to a depth of 10 inches or more gave only small and inconsistent improvements in crop yield, in soil aeration, and in water relationships, over ploughing to 4 inches. The small differences were quite inconsiderable in relation to the extra cost, and it was concluded that there was no justification for deep cultivation in soils of good texture (Ref. 19).

The effects on the soil were studied by C. Culpin (Ref. 20); they were often quite noticeable, but they did not extend as far as the plant. What may happen later remains to be seen.

If it should turn out to be true that cultivation is absolutely necessary only for making a seedbed, and that later work is needed only for dealing with weeds, it might happen that chemical treatment with sprays would be more economical. The available information about spraying has recently been collected by Long and McDowall (Ref. 21), while J. D. Newton and A. D. Paul (Ref. 22) have made numerous experiments at Edmonton,

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[1] For convenience some of them are summarized here :—

	Yield. Tons per Acre.		
	Ordinary Cultivation.	Intensive Cultivation.	S.E.
Rothamsted Sugar Beet—Roots	14·0	13·0	± 0·098
Tops	15·9	13·3	± 0·245
Woburn „ „ Roots	12·0	11·8	± 0·147
Tops	15·5	16·1	± 0·183
Kingennie Potatoes	14·2	14·1	± 0·127

I.—GYROTILLING FOR SUGAR BEET (Ref. 18).

	Yield in Tons per Acre.		
	"Gyro-tilled."	Control.	Significant difference.
Weight of Tops . . .	10·64	10·15	1·31
Weight of Washed Beet . .	14·53	14·63	1·06
Weight of Sugar . . .	2·256	2·265	0·157

II.—SPRING CULTIVATION FOR AUTUMN SOWN WHEAT (Ref. 19).

	Yield in Bushels per Acre. Autumn Sown Wheat.				
	Roll.	Harrow.	Roll and Harrow.	No Spring Cultivations.	Significant difference.
Heavy Land—					
1930–31 .	—	—	34·59	31·35	2·25
1932–33 .	66·89	67·23	66·39	65·20	2·38
1933–34 .	58·26	57·28	57·72	58·80	2·35
1934–35 .	50·64	48·39	49·08	48·62	2·97
Light Land—					
1930–31 .	—	—	47·84	43·36	5·45
1931–32 .	35·56	34·91	35·03	34·87	2·60
1932–33 .	34·84	36·32	33·45	35·54	5·50
Chalk—					
1934–35 .	21·19	19·22	23·51	17·33	3·72

Alberta, to find out how long the various substances remain harmful in the soil. Copper sulphate soon became harmless, but sodium chlorate and certain others lasted longer; the dressings used were, however, heavier than would be likely to reach the soil in actual practice.

LIMING.

It is well known that much of the land in this country needs lime. A remarkable survey is reported by A. W. Oldershaw (Ref. 23) of an area of 25,000 acres in Suffolk of which 7,000 acres was found lacking in lime. The actual figures are so striking that they deserve to be quoted :—

Land acid enough to reduce beet and barley by about 20% .	3,305	acres
Land acid enough to reduce beet and barley seriously or even give complete failures	2,549	"
Land extremely seriously short of lime; complete failure of beet and barley in most seasons	1,237	"
Total area lacking in lime	7,091	"

An earlier paper by Oldershaw showed very clearly how greatly crops differ in their need for lime. Oats and rye are very tolerant of acidity and hardly benefit by lime or chalk; potatoes benefit only on very acid land. On the other hand, sugar beet is very intolerant of acidity, and, indeed, the Rothamsted investigators show that many farmers lose yields of sugar beet through failure to lime their soils sufficiently, which is unfortunate in view of the fact that waste lime is usually easily obtainable from the factories. Oldershaw's results obtained at Tunstall were :—

EFFECT OF CHALK, 5 TONS PER ACRE, ADDED IN WINTER OF 1925–26, TUNSTALL (Ref. 24).

Average yields for 3 years, 1927–29.

Yields per acre.	No Chalk.	Chalk added.
Rye, grain, cwt.	25·3	29·5
„ straw, „	42·7	47·5
Sugar Beet, tons	0·3	10·3
Potatoes, tons	8·8	13·0
Oats, grain, cwt.	25·6	26·0
„ straw, „	29·3	25·9

Some years ago the idea got abroad that burnt lime exhausted the organic matter of the soil, while limestone did not. The evidence always quoted was derived from well-known Pennsylvanian experiments as interpreted by Frilar and by Cyril Hopkins. Later on it was shown that the interpretation in question was wrong, and that there was no evidence whatsoever to justify the statement; indeed, the evidence was all the other way, and showed that burnt lime and limestone both helped to conserve rather than to destroy the nitrogen and organic matter. Further evidence that burnt lime has no harmful effect on the nitrogen or organic matter content of the soil is afforded by the Woburn experiments. Unfortunately, it is always difficult for a correction to catch up with a wrong statement and, judging from our correspondence and from many questions asked by farmers and students, one gathers that the old wrong idea is still circulating, which is distinctly unfortunate (Ref. 25).

As will be shown later on, the Woburn experiments prove that the small doses of lime are more economical than large ones and result in smaller losses. This agrees with the results obtained by Rice Williams (Ref. 26) in his examination of the soils of the experimental farm at Bangor and of other soils in North Wales. The rate of loss of the exchangeable lime depends on the drainage and on the amount of exchangeable lime originally present, being larger for a high content of lime than for a low one. From lysimeters at Bangor, 80 lb. of lime (CaO) per acre was lost per annum, this figure being of the same order as that obtained at Craibstone. Taking the results as a whole, they are as follows :—

Loss, lb. per acre per annum of exchangeable lime (CaO).

Average	106
Highest	224
For soils originally containing :—	
Below 0·25%	75
Above 0·25%	157

The recommendation is that for soils containing 0·25 per cent. exchangeable lime—which is regarded as satisfactory—a dressing of 2 cwt. of lime (CaO) per annum would be needed to maintain a proper lime condition ; the dressings should be higher, however, where the rainfall is higher or the initial lime-content less.

There has been much discussion on the relative values of magnesian limestone and purer forms of limestone. The subject is under examination at Rothamsted. In the Rhode Island experiments no difference could be found (Ref. 27).

CROP PRODUCTION.

During the past few years many experiments have been made on the responses of the more important crops to fertilizers. When one recalls the fact that some £6,000,000 was spent by farmers on fertilizers in 1934–5, it is evident that a small improvement in the efficiency of utilization would amount to the saving of a very substantial sum.

The experiments show, however, that with our present methods the farmer recovers only a part of the fertilizer used. Of the nitrogen applied, even in the most efficient fertilizers, not more than 40 to 60 per cent. is recovered, the lower figure being more usual than the higher. Recovery of phosphate is smaller and, even on grassland and after residual effects have been taken into consideration, rarely exceeds 25 per cent. Numerous experiments are now being made to explore the possibility of a better utilization of the fertilizer, and in the recent experiments on sugar beet and potatoes the fertilizer tests are usually combined with cultivation tests such as time of sowing, width of spacing, method of placing manure, etc.

GRASSLAND EXPERIMENTS.

As in previous years, a number of grassland experiments have been carried out in different parts of the country to compare the values of the different types of basic slag which are now available or are likely to become so, and also to study the effects of the even cheaper mineral phosphate. These experiments are carried out under the ægis of the Ministry of Agriculture Basic Slag Committee, and at the request and largely at the expense of the slag makers ; they are being continued and extended to include certain new types of slag which have become available with changes in the methods of steel making. The result has been to prove the general superiority of high-soluble basic slag over other forms, although the low-soluble slags and the mineral phosphates are both valuable in certain conditions, which conditions are gradually being discovered. Already these investigations have had the very useful result of increasing the proportion of the effective slags as against those of less agricultural value ;

this is shown by the following figures of deliveries of ground basic slag in Great Britain :—

	Deliveries, Tons.			Percentages.	
	High-Soluble (80% or more).	Low-Soluble.	Total.	High-Soluble (80% or more).	Low-Soluble.
1924–1925 . .	126,025	117,514	243,539	51·8	48·2
1929–1930 . .	222,342	83,407	305,749	72.7	27·3
1934–1935 . .	203,070	77,353	280,423	72·4	27·6

The new medium-soluble slags, however, present special difficulties in that they show greater differences in effect than can be accounted for by their varying solubility in citric acid. No satisfactory method of evaluation has yet been designed, but there is little doubt that this will be done.

An increase in the development of clover in a pasture is known by practical men to improve its feeding value, and some measurements of the effects have been recorded by U. Iorwerth Jones (Ref. 28). Proper manuring increases the feeding value more than is shown by analysis of the herbage.

Prof. R. G. Stapledon has recorded some of the results obtained in the well-known Julien Cahn reclamation experiments on a hill farm in Cardiganshire (Ref. 29). In 1933, owing to the generosity of Sir Julien Cahn, Bart., the Welsh Plant Breeding Station was able to take possession of a large acreage of hill land, and the Cahn Hill Improvement Scheme was inaugurated. The aim of the Cahn Hill Improvement Scheme is not to conduct detailed botanical and chemical investigations, but to test the various treatments which the earlier researches have suggested, and to experiment on the management of stock and of the improved pastures, and in general to evolve a sound practical technique for the improvement and maintenance of hill grazings.

There are some eighteen million acres of rough and hill grazings in Great Britain, thirteen million in Scotland, three-and-a-half million in England, and one-and-three-quarters million in Wales. Of these areas, three million in Scotland lie above the 1,500 ft. level and are therefore not very promising material, but 3 million in England and 1·4 million in Wales lie below this level, and something could be done with them.

Three publications have appeared this year in regard to the work, of which *The Land, Now and To-morrow*, is the most important.

The basis of the improvement is the establishment of wild white clover. The first step is to remove the roughage, bracken, gorse, rank grass, etc. (an effective means of mowing over rough urfaces is still wanted), then to give a heavy dressing of phosphate and sow white clover, if necessary roughening the surface by harrowing to assist the spread of the clover seed. Alternatively the land is worked heavily to destroy the wild vegetation, and clovers and grasses are sown and manured with nitrochalk and phosphate. Another method is to plough up and sow a seeds mixture.

These operations may be repeated at intervals of about five years on the same land; the final purpose is to establish perennial ryegrass.

Prof. Stapledon considers the rotary cultivator, driven from the power take-off of a tractor, the most satisfactory implement for hill grassland. The Pitchpole harrow is also good, but it must be used repeatedly.

He also recommends hill farmers to increase the size of their "intake" and develop high-class long-duration leys, growing also hardy green turnips and Italian ryegrass. On the open hill they should make patches and strips of improved herbage, containing more minerals and protein than the natural herbage, and being therefore beneficial to the health and vigour of ewes and lambs. He points out that some of the so-called weeds of lowland pastures—rib-grass, daisy, hawkweed and buttercup, normally absent from upland grazings—are rich in minerals and therefore serve a useful purpose.

As sometimes happens elsewhere, a small dressing of slag is nothing like as effective as a large one. The so-called Law of Diminishing Returns is by no means absolute, as is clearly shown in these experiments. 15–20 cwt. slag per acre gave much better results than 2–5 cwt. for the establishment of perennial ryegrass, crested dogstail, and wild white clover. The number of tillers per 2½ square feet of a four-year-old sward were :—

	Perennial ryegrass.	Dogstail.	Yorkshire fog.	White clover.
Light slag dressing . .	15	40	140	14
Heavy slag dressing . .	260	540	160	211

The difference in the effects is partly due to soil acidity, for the action of the light dressing of slag was much improved by an addition of 5 cwt. lime per acre. Stapledon's recent practice for laying down pastures on hill farms has been to give 6 cwt. slag and 1 cwt. nitrochalk per acre at the time of sowing, and 6 cwt. ground rock phosphate per acre a year after sowing.

For hay, as is well-known, a nitrogenous dressing is usually effective, and a complete fertilizer may be better. A hay experiment carried out at the Lady Manners School, Bakewell, Derby, gave the following results in cwt. hay per acre as the means for the five years 1931–35 (Ref. 30) :—

	No nitrate of soda.	Nitrate of soda.
Superphosphate and Potash Salts	42·0	63·4
Superphosphate, but no Potash	39·8	50·7
Potash, but no superphosphate	35·8	53·0
No potash or superphosphate	39·3	49·9

The effect of potassic manuring on the composition of hay has been discussed by W. Lesch (Ref. 31). In a good Black Forest hay the proportion of lime to potash ($CaO : K_2O$) was 100 : 108 ; in a bad sample, which failed to nourish calves but gave them deficiency diseases, the proportion was 100 : 428 ; in cow's milk the proportion is 100 : 100. This author found that potash manuring tended to raise the potash content and depress the lime content of the herbage, and so change it in the harmful direction. In ordinary manurial practice no trouble is likely to arise on this score, however, as potash also encourages clovers, which naturally contain a good deal of lime.

ARABLE CROPS.

Comparison of calcium cyanamide with sulphate of ammonia.

A number of careful comparative experiments on these fertilizers have been carried out by the Rothamsted staff and the results are summarized by E. M. Crowther (Ref. 32). For spring-sown crops responding to nitrogenous fertilizers an application of cyanamide was about 80 per cent. as effective as one of sulphate of ammonia supplying equal quantities of nitrogen. The results were :—

SPRING-SOWN CROPS GIVING CLEAR RESPONSE TO NITROGEN.

		Response to cyanamide as % of response to sulphate of ammonia.
Barley grain—Rothamsted,	4 experiments	92
other centres,	2 "	70
Potatoes	5 "	78
Sugar beet ; roots	4 "	79

Autumn-sown oats and wheat responded less to nitrogenous fertilizers and there were no regular differences in effect. Dicyanadiamide applied to wheat in autumn appeared to be beneficial.

WHEAT.

The question when best to apply nitrogenous fertilizer to wheat has been much studied. Very variable results have been obtained, the effect of the nitrogen depending largely on the weather. Excessive rainfall may wash the nitrogen beyond the range of the plant roots, while lack of rain may so limit growth that additional nitrogen, even if taken up by the plant, could not be utilized.

The influence of variable water-supply can be eliminated in pot-culture, and in these conditions Dr. Watson found that nitrate of soda gave the same increase in grain yield at whatever time, from seed time till the end of May, it was applied. A still later application, after ear emergence in June, had no effect on yield, although the nitrogen was as fully taken up as before. The yield of straw, however, fell off steadily with later application, though the grain was larger and of higher nitrogen content. This suggests that application towards the end of May is likely to be most efficient, since the yield of grain is the same as for early application, while the quality of grain is better and the increase of the straw and, therefore, the liability to lodging are less.

The results of field experiments at Rothamsted (Ref. 33) and Woburn are consistent with this view. From 1926 to 1931 seven complex experiments were carried out at Rothamsted, in which early and late dressings of sulphate and muriate of ammonia were applied. The average responses were :—

Increase produced by 0·2 cwt. nitrogen per acre (mean of sulphate and muriate of ammonia), Rothamsted.

	Applied early (March)*	Applied late (May)*	S.E.
Grain, cwt. per acre .	1·12	0·81	± 0·23
Straw, " " " .	3·63	2·76	± 0·27

* Except for one "early" application on April 11th and one "late" application on June 5th.

The difference was not significant for grain, but it was for straw, late application giving significantly less increase than early application.

A second series of experiments was begun in 1934, at Rothamsted and Woburn, in which a wider range of times of application was tested. In 1934 no significant increases were obtained. In 1935, January application gave the greatest straw yield at Rothamsted and Woburn; for later applications the increase in straw yield fell steadily, as in the other experiments. There was no significant increase in grain yield at Rothamsted. On the other hand, at Woburn, there was a significant response though, as in the pot experiment, the time of application caused no difference in the result.

Wheat is commonly grown at that stage in a rotation when the fertility of the soil is at its highest. The comparatively small increase of grain yield in the 1926–31 series of experiments at Rothamsted, and the absence of any response in 1934 and 1935, raise the question whether nitrogenous fertilizer is necessary for wheat on land in good heart.

Early spring applications of nitrogen frequently produce spectacular increases in the thickness, height and colour of the wheat in May, when tillering is at its maximum and elongation of the shoots is beginning, while the effect of later dressings is much less obvious. This was shown by counts of shoots and by measurements of height at Woburn 1934 and 1935. But these marked differences were not accompanied by corresponding increases in grain yield. It thus appears that high tillering rate is less important for determining grain yield than has sometimes been supposed. Nitrogenous fertilizer applied in March increased the number of shoots per plant while a May dressing did not; yet both gave the same increase in grain yield. Miss M. Barnard analysed the data collected under the Ministry of Agriculture's Wheat Observation Scheme (Ref. 34), over a period of three years at five centres, differing widely in soil-type and climate. The maximum shoot number varied between 8,000 and 4,000 per 35 yards of drill row, but no significant connection between grain yield and high shoot number was found. The wide variations in maximum shoot number tended to disappear at the time of ear emergence, and at all centres and for each of the years there were then about 2,000 shoots per 35 yards, whatever the original number had been. The popularity of early nitrogenous dressings for wheat may be partly due to their obvious effect on spring growth. A lush early growth, however, may mean only a heavier straw crop and difficulties at harvest due to lodging, with no advantage in extra grain yield.

This does not apply, of course, to systems of farming involving frequent corn crops with little dung, and where wheat does not follow a ley, a leguminous crop or a fallow. Here nitrogenous manuring is usually necessary.

These results agree in general with those obtained by the Cambridge workers. F. H. Garner and H. G. Sanders (Ref. 35) found that early nitrogenous dressings tend to promote tillering, while later ones tend to increase ear size; but their "early" dressings had to go on in autumn to give this effect. February dressings behaved like the later dressings at Rothamsted, and did not promote tillering. On the light soil in good heart these effects on tillering did not lead to increased, but rather to decreased yields, the result of lodging and of increased attack by foot-rot fungi. On the other hand, on the heavy soil in poor condition nitrogenous fertilizers produced increases in yield. The effect on yield of varying the time of application depended on the weather. The Cambridge workers state that wet winters did not suit the autumn dressings so well as dry ones. This does not agree with the results of the comparison at Rothamsted, which has been going on now every year since 1854 (Ref. 36). At Rothamsted there is no evidence that winter rainfall is detrimental to seed-time application; on the other hand, summer rainfall undoubtedly is. The seed-time applications at Rothamsted are not as effective as the spring dressings, except when the summers are dry. The Cambridge recommendation is to apply half the nitrogenous dressing at sowing time and half in May.

The Rothamsted results accord with this advice, provided a dry summer can be relied upon.

MALTING BARLEY.

The area under barley has shrunk a good deal in the course of the last fifty years. In the 1880's some two million acres of barley were grown in this country; now the acreage is only about half that. In the old days barley was cultivated in most of the country lying south of a line drawn south-westwards from the Yorkshire Wolds to the Bristol Channel, but now the Western districts have lost much of their acreage and the line is from the Yorkshire Wolds to the Isle of Wight. The chief barley-growing counties are still, as in the old days, Norfolk, Cambridge, Lincolnshire and Yorkshire; but there has been a notable shrinkage in Leicester, Staffordshire, Warwick, Worcester, Stafford, Bucks and Sussex. There are two very good reasons: less beer is drunk than formerly and it is lighter; while, owing to cheap imported supplies, there is less necessity to grow feeding barley.

The production of a good malting sample is not only satisfying to the income of the farm but is a source of much professional pride to the farmer, and in recent years a good deal of work has been done at Rothamsted and elsewhere under the Institute of Brewing Research Scheme to discover the conditions under which this can be done.

In the autumn of 1934 and again in 1935 conferences were held at Rothamsted on the growing of malting barley. They took the form of an exhibition of barley samples sent in by farmers from all parts of the country, and graded by the Barley Valuation Committee of the Institute of Brewing. A summary of the results is given in the Rothamsted Annual Report for 1935 (Ref. 37). The samples are divided into seven grades, each being worth about 5*s.* per quarter more than the one below it.

Kent and Essex sent in mostly samples of Plumage-Archer, Norfolk sent Spratt-Archer, while Plumage was received in quantity only from Yorkshire. Spratt-Archer and Plumage-Archer together accounted for almost three-quarters of the samples.

Most of these samples came from medium and light soils, few from heavy soils; one-third were from soils on or close to chalk, limestone, oolite, or stone brash.

About 14 per cent. of the samples in each season were autumn sown, and these usually graded better than the spring-sown barleys. Thus for two years:—

In grades I., II. and III.	35%	were autumn sown.
In grades IV., V.	12%	" " "
In grades VI., VII.	8%	" " "

Certain districts favoured autumn sowing much more than others; for example, in 1934, nearly half the barleys from Essex had been autumn sown, and in 1935 nearly three-quarters.

In Norfolk barley now commonly follows sugar beet instead of swedes and turnips. Elsewhere, however, it still follows turnips. Apparently it rarely follows potatoes.

Number of Barley Samples graded at Rothamsted 1934-5.

Barley after	1934 All counties.	1935 Norfolk.	1935 Others.	1935 All counties.	Both Years Total.
Cereals . . .	90	22	69	91	181
Beet and mangolds .	38	58	39	97	135
Swedes, turnips, kale .	19	10	30	40	59
Clover, peas, etc. .	15	5	10	15	30
Potatoes . . .	2	—	3	3	5
Bare and half fallow .	3	—	1	1	4
Other crops . .	1	2	6	8	9

Much information was obtained about the manuring of the barley. It is no longer a " starvation " crop. Of the 270 samples sent in in 1935, 159 had received manure; 124 had received nitrogenous fertilizer, and no less than sixty-one of these had followed beet, turnips, or some other crop receiving dung—showing that the growers were prepared to give nitrogen even on land already in good condition. Some fifty-one crops had received compound fertilizers which, in twenty-one cases, were the new high-grade materials containing ammonium phosphate; but many growers preferred to make their own mixtures.

CULTIVATION OF SOYA BEANS IN ENGLAND.

Experiments on soya bean culture at various centres have been summarized by the writer (Ref. 38) and show that the brown variety produced by Prof. Southworth at the Manitoba Agricultural College can be grown in the Southern counties. The problem is now simply whether it is more economical to produce the beans here or import them. About half a ton of seed per acre may be expected, and at £7–£8 per ton this gives a gross return of £3–£5 per acre plus the value of the straw. No special cultivation or manurial problems seem likely to arise.

CHICORY.

A factory for drying chicory having been erected at Needingworth, near St. Ives, Huntingdonshire, experiments were made by F. Hanley and F. Tunnington (Ref. 39) to ascertain the responses of the chicory crop to fertilizers. The yields at the various centres ranged from 6 to 18 tons per acre, but these differences resulted from differences in general soil conditions and at no centre did fertilizers definitely increase the yields. Chicory seems to be a particularly unresponsive crop.

EXPERIMENTS ON VEGETABLE CROPS.

The importance of vegetable crops has considerably increased during recent years. Thus, for certain of the more important crops, the acreage returns for 1922 and 1934 were as follows :—

Crop.	Acreage. 1922.	1934.	Increase per cent.
Carrots	14,084	16,432	+16
Onions	3,557	2,099	−59
Cabbage	27,954	36,981	+32
Brussels sprouts	14,951	34,048	+128
Cauliflowers and Broccoli	10,475	20,107	+92
Celery	5,282	7,510	+42
Rhubarb	5,718	8,233	+44
Green beans	12,907	16,833	+30
Green peas	50,894	74,363	+45

Prices also have been well maintained as compared with those of general farm produce ; the agricultural index of all vegetables in 1934 was 143 (1911–13 = 100) whereas the general index of agricultural produce for the same year was 114.

The first experiments on vegetable crops conducted from Rothamsted, using the new technique, began in 1931, and included trials on winter cabbages, brussels sprouts, and first-early potatoes. There have now been put on record in the Station Reports some fifty experiments on vegetable crops carried out at Rothamsted, Woburn and outside centres, and by local workers operating general schemes of investigation administered from Rothamsted. The results are summarized in the recent Rothamsted report (Ref. 40). For brussels sprouts the yields ranged from 22·4 to 90·8 cwt. of saleable sprouts per acre with a general mean of 44·3 cwt. The most marked manurial effect was given by nitrogen, but this varied considerably with the season. A dressing of 3 cwt. sulphate of ammonia gave an additional 13 cwt. of saleable sprouts in 1934, but only 1½ cwt. in 1933. Poultry manure supplying the same amount of nitrogen was only about half as effective as sulphate of ammonia in 1934, the year of good response, though it had done rather better than the sulphate of ammonia in 1933, the year of poor response. On two heavy soils superphosphate was beneficial, particularly on a boulder clay in Bedfordshire ; here, 3 cwt. of superphosphate per acre gave no less than a 10 cwt. increase in saleable sprouts per acre. Potash also, where it was needed, gave marked returns.

Even more important, however, is the fact that the properly manured crops were earlier than the others; where the manure was effective its action was strongest in the early part of the season.

Manuring did not reduce the actual weight of "blown" or unsaleable sprouts, but it increased the saleable sprouts more than it did the unsaleable ones. Taking the results as a whole, the effect of manures appeared to be slightly to increase the actual weight of "blown" or unsaleable sprouts, but when the crop responded well to manures the final result was that the proportion of unsaleable produce was reduced.

Spring cabbages responded well to nitrogen as sulphate of ammonia, so also did broccoli heads, red beets and early potatoes. On the other hand, there were no marked effects of phosphate or potash, suggesting that quick-acting nitrogen is likely to prove the most useful fertilizer for these crops.

First-early potatoes did not respond much to manuring, but those left growing longer did so. Carrots were particularly unresponsive; and onions generally so, though at one or two centres poultry manure gave a good increase.

Peas have given very different results at the different centres; sulphate of ammonia at one centre increased the yield and at another decreased it.

With French beans there was some indication of a response to poultry manure, but none to sulphate of ammonia. There were no effects on runner beans, or on lettuces for cutting in spring.

On strawberries, poultry manure was more effective than sulphate of ammonia, which, indeed, gave no increase but rather a decrease of crop.

Celery proved more responsive and at the fenland centre gave good returns for superphosphate and for potash; the latter fertilizer also improved the grading.

There clearly remains much to learn about the manuring of vegetables. The experiments have hitherto been difficult to carry out, but the new methods developed at Rothamsted enable this to be done much more readily than before, though as yet experimental errors are higher than in ordinary field experiments. For ordinary farm crops standard errors of about 7 to 8 per cent. may be regarded as normal, while for these experiments with vegetables the errors were usually about 10 per cent.

It is stated from time to time that manuring with artificial manures alone and no organic matter is detrimental to the feeding quality of crops. No evidence in support of this statement is available for European countries or for Great Britain. The claim has been tested at the Institute for Veterinary Physiology at Leipzig and found to be entirely without foundation; rats nourished on a diet grown exclusively with artificial manures did better than on those grown on unmanured land (Ref. 41).

THE RESULTS OBTAINED AT THE WOBURN EXPERIMENTAL FARM.

The Woburn field experiments were started in the year 1876 by the Royal Agricultural Society. After they had continued for fifty years the results were examined by the Rothamsted staff, using the new statistical methods developed under R. A. Fisher. Some delay occurred in preparing the results for the Press, but they have now been published (Ref. 42 .

The experiments on wheat and on barley were, as at Rothamsted, continuous, *i.e.*, the same crop was grown on the same land each year, and always given (with few exceptions) the same fertilizer. The results show, as at Rothamsted, that continuous cropping of this kind is quite feasible, and, so long as the proper fertilizer is supplied, results in moderate yields. But, as at Rothamsted, the yields do not remain constant. In the early years they are good but, after a while, they fall to a lower level, the fall, however, becoming progressively slower. The best results are obtained with complete fertilizer and with farmyard manure, but larger amounts are needed than in ordinary practice, while the yields are not as good. Moreover the fertilizer steadily loses its efficiency, giving less results in the later years of the experiment than in the earlier. Better results are obtained when periodical fallows are given, but they have their dangers in that they harbour certain pests, *e.g.*, the wheat bulb fly; fallows are also less effective when the winter happens to be abnormally wet.

This plan of growing wheat continuously has proved successful on several farms; an outstanding example was that of Mr. George Baylis, of Wyfield Manor, Newbury, Berks., who at the time of his death in May, 1936, was the largest arable farmer in the country. He had developed methods of keeping his chalk land in cultivation that enabled him to survive when many others were crushed out, and his system was based essentially on continuous cereal crops, fed by chemical manures, with occasional fallows when weeds became too numerous (Ref. 43).

Both for wheat and for barley, at Woburn, farmyard manure applied at the rate of about 8 tons per acre per annum maintained the yields better than any other treatment. The complete artificials, using nitrate of soda as the source of nitrogen, came next, and for wheat these were not far behind farmyard manure; for barley, however, they were less effective. With the larger of the dressings of nitrate of soda that were used the results for artificial fertilizers showed more resemblance to those obtained with farmyard manure, and it is possible that, at equal doses of nitrogen, the difference attributable to organic matter might have been only small. There was no evidence for the statement so often made that nitrate of soda, used alone, tends particularly to exhaust the soil, although, naturally, it was less effective in the absence of potash and superphosphate than when used in conjunction with these. The rates of deterioration were no greater on the plots receiving nitrate of soda alone than on the unmanured land, and this despite the higher yield and the consequently greater drain on the mineral constituents of the soil.

The rates at which the yield deteriorated during the period 1877–1906 were :—

	Wheat.		Barley.	
	Bushels per acre per annum.	Percentage.	Bushels per acre per annum.	Percentage.
Nitrate of soda—Plot 3a .	·33	1·5	·7	2·25
No manure Plot 1 .	·40	3·2	·7	3·8
No manure Plot 7 .	·30	2·0	·4	2·3

Of the two groups of nutrients, nitrogen was the more important for maintaining the yield of wheat, whereas the mineral fertilizers were more important for maintaining that of barley. This difference between wheat and barley leads to some rather striking results. The nitrogen retained its effectiveness on the wheat crop, and produced increments of total produce and of grain which kept up fairly well to the end. But it did not maintain its effectiveness for barley ; here, the increments fell off in the later years. Thus in the early years 1 lb. of nitrogen, applied as nitrate of soda in a complete fertilizer, gave an increment of some 73 lb. of total produce in the case of barley and of 70 lb. for wheat ; in the last twenty years, however, the increments were 64 lb. for wheat, but only about 40 lb. for barley. Farmyard manure, on the other hand, retained its effectiveness, and the later dressings were practically as effective as the earlier ones had been. The cause of this remarkable difference is not known, but the figures are quite clear :—

INCREMENTS GIVEN BY NITRATE OF SODA, AND BY FARMYARD MANURE, PER LB. OF NITROGEN SUPPLIED.

	First 15 *years.*		*Second* 15 *years.*		*Last* 20 *years.*	
	Barley.	Wheat.	Barley.	Wheat.	Barley.	Wheat.
Grain.—						
Farmyard manure . .	8	6	10	8	11	8
Nitrate of Soda . .	29	24	24	22	18(*a*) 15(*b*)	25
Total Produce.— . .						
Farmyard manure . .	18	18	25	24	27	25
Nitrate of Soda . .	73	70	59	58	42	65

(*a*) Plot 6, but dressing halved. (*b*) Plot 9, but same dressing as previously on Plot 6.

Closely associated with this deterioration of yield, and perhaps the immediate cause of it, is a diminished uptake of nitrogen by the plant. For the first few years the barley took up nearly 30 lb. of nitrogen per acre per annum from the soil; in the last five years it took only 7 lb. from the unmanured and 12 lb. from that receiving mineral manures alone.

In the fifteen years 1877-91 there was but little deterioration of yields on the plots receiving complete fertilizer with nitrate of soda (Plot 6), and the barley took up some 62 lb. of nitrogen per acre per annum—this being 34 lb. more than on Plot 4 without nitrate of soda. In other words the utilization was nearly 90 per cent. However, in the last five years, 1922–26, when deterioration had become marked, the barley took up on an average only about 20 lb. of nitrogen per acre, being about 9 lb. more than on Plot 4, a utilization of only some 45 per cent.

Apart from its size the crop itself showed but little change. The straw, of course, became shorter as the years went by, but the proportion of grain to straw did not fall until towards the end of the fifty years. The weight per bushel of grain and the weight of 1,000 corns fluctuated about the same levels throughout, and showed no regular tendency to fall, except again right at the end of the experiment. Such small changes as occurred were more pronounced in the case of barley than for wheat. The nitrogen content of the barley grain did not tend to move either up or down.

Chemical examination of the soil showed that the annual dressings of farmyard manure kept the proportion of carbon and of nitrogen in the soil at about its original level, but where artificial manures were given without farmyard manure the carbon and nitrogen content of the soil fell by about one-third of the original value.

The figures were, as percentages of air-dry soil, approximately as follows:—

	At beginning. 1876.	At end.	
		Farmyard manure plot.	Artificial manure only and unmanured
Carbon	1·48	1·5	1·0
Nitrogen	0·155	0·15	0·09

As between the various artificial manure treatments there was little to choose. There was also little difference between the wheat and the barley plots, and such differences as existed were not obviously connected with cropping or manuring. They might easily be attributed to soil variation. The results are very similar to those obtained at Rothamsted. Analysis showed that on the plots receiving farmyard manure, nitrate of soda only, minerals only, and no manure, the crop obtained about half the nitrogen lost from the soil and supplied in the manure; but that the recovery rose to about two-thirds where complete artificials were given. There was no evidence of any change in the nature of the soil organic matter—the ratio of carbon to nitrogen in the soil remained about 9·7, with no indication of any difference between the unmanured plot and that receiving farmyard manure, or between the earlier and the later years of the experiment.

The falling-off in the quantity of organic matter in the soil accompanied the deterioration of the yields, but there was no close connection. No connection could be traced, for example, between the carbon or nitrogen content of the soils at the end of the period and the mean yields for the preceding ten years.

The replaceable bases in the soil also diminished during the fifty years of the experiment, but these changes, as would be expected, were fairly clearly related to the manuring. The fall was less pronounced on the plots without nitrogenous fertilizer and was least where farmyard manure or complete artificial manures were given with nitrate of soda.

The deterioration in yield was temporarily overcome by fallowing, which caused a remarkable rise in yields for a season, but after that the crops speedily fell back to their old low levels. The deterioration was not peculiar to continuous cropping, but was shown on the rotation plots also where no farmyard manure was given.

It is not yet possible to account with certainty for this deterioration. Weeds and the accumulation of diseases such as foot-rots are no doubt important factors, but do not seem to supply the full explanation. There is no evidence of any harmful plant excretions. The most probable cause of the deterioration seems to be the exhaustion of some soil constituent necessary for full plant growth under field conditions. The failing element is not likely to be potassium or nitrogen, since the increments obtained, per lb. of nitrogen, fall off as deterioration progresses; it may be some element such as boron or manganese, though this seems unlikely. The decline seems to be associated with the exhaustion of the organic matter, but it is not easy to see why. The soil remains in good physical condition both at Woburn and at Rothamsted, and if the effect of the organic matter on plant nutrition were simply to supply nitrogen, it is difficult to understand why the artificial fertilizers should not produce the same effect.

Not all forms of organic matter prevent the deterioration—neither rape cake nor ploughed-in mustard or tares, nor the excretions from folded sheep, nor small quantities of farmyard manure, had this effect.

The observations, indeed, suggest that the straw is the source of the effective agent. Undecomposed straw does not itself enhance soil fertility, but during its decomposition the lignin, or some decomposition product of the straw, apparently combines with protein to form humus. It is not known whether the deterioration results from the loss of humus or of some other products of decomposition.

The question of deterioration never assumed any practical significance in the days when the standard practice was the four- or five-course rotation, including a good dressing of farmyard manure once during the period, with the folding of sheep on the leys and often on the roots as well. Nor did it arise in market-garden practice where growers were able to obtain large quantities of cheap stable manure from towns. It has, however, become important to market gardeners since the displacement of horses by motors in the towns, and it affects the so-called "mechanized farmers" who maintain an area of arable land larger than corresponds with their head of live stock.

During the course of these Rothamsted and Woburn experiments the general results have become well known. This present investigation emphasizes the need for supplying organic matter; the risk that the benefit of fallow may be offset by the attacks of wheat bulb fly; and the fact that a succession of wheat or barley crops may lead to serious accumulation of the foot-rot fungus.

The question of the most suitable farm rotations to adopt in mechanized farming is very important, and it was discussed by H. G. Sanders at the Oxford Conference on the mechanization of mixed farming held in January, 1936 (Ref. 44). He condemned the rotation wheat—wheat—bare fallow as wholly bad, because of the damage done by bulb fly and the exhaustion of the soil organic matter. A mustard fallow is somewhat better, but there is still the risk of foot-rot in wheat, to say nothing of the bad distribution of labour.

Wheat—wheat—seeds is a little better where the second crop of seeds is ploughed in for green manure, but it has the disadvantage that cleaning is restricted and the risk of bulb fly still remains. The rotation wheat—barley—fallow is better than wheat—wheat—fallow because it allows of better labour distribution and variety of cropping, but it has the disadvantage that barley is susceptible to foot-rot. Oats would be better, but the mechanized farmer without live stock has no outlet for them. The above rotations are suitable only where no live stock is kept, because they provide no fodder.

A combination of mechanized mixed farming with live stock has the considerable advantage that it provides dung. The cost of handling and spreading of dung, however, is high, and better mechanical appliances are needed. Owing to the cost it is necessary to grow crops that can be sold at a high price. Sugar beet is probably the most promising of these, and the necessary "mechanizing" implements are not costly. Kale is suitable where cattle are kept, while mixtures of beans, oats and tares for silage fit in conveniently between hay-time and harvest, and can readily be handled on mechanized farms; they would be followed by a bastard fallow. On light mechanized farms a convenient rotation would be sugar beet—barley—seeds with peas over part of the wheat-break. But since cereals always attract the mechanized farmer an alternative is: sugar beet or fallow—wheat or barley—barley or wheat—seeds—wheat—barley or oats.

For clay land the following is suggested: beans, or silage and bastard fallow—wheat—barley or oats—seeds and bastard fallow—wheat—oats or barley.

ORGANIC MANURES.

In view of the need for farmyard manure, and the fact that many farmers nowadays make insufficient for the needs of their farms, experiments have been going on for some years at Rothamsted, and are now started at Woburn and at Sprowston, to discover whether straw can be usefully returned to the land in any other form than that of farmyard manure. Two methods are being studied in detail. In the first, the straw is rotted by the action of micro-organisms, the method being the well known Adco process based on the investigations of Hutchinson and Richards at Rothamsted; in the second, the straw is ploughed into the land, the necessary food for the micro-organisms being added simultaneously as a dressing of artificial fertilizer. A comparison with farmyard manure is being made, and in due course the results will be announced.

The Hutchinson-Richards or Adco method is now very widely used and large quantities of manure are made annually. In France the method has been applied by Demolon and Burgevin and by Lafette and Caudron to the needs of the horticulturist so as to supply manure, hot beds for forcing, and the long beds or "meules" on which mushrooms are grown in caves. A convenient booklet of instructions has been issued for the use of the practical grower (Ref. 45).

A modification of this method, known as the Indore process of compost making, has been developed by Sir Albert Howard and his co-workers at the Institute of Plant Industry, Indore, Central India, from 1925 onwards. The process was fully described in a book, *The Waste Products of Agriculture*, published in 1931, and more recent developments have been reported from time to time (Ref. 46).

Waste organic matter derived from unused farm crops, weeds, etc., is mixed with "urine earth" from cattle sheds, wood ashes and cattle dung into a compost. The heaps are mixed, watered and turned according to a carefully considered system, and, after they have undergone hot aerobic fermentation, the resulting product is a humic powdery material that has proved itself a useful organic manure.

The paper describes results obtained with coffee, sisal and maize in Kenya, and with tea and sugar-cane in India. Sugar-cane, maize and sisal each provides residues in quantity, but others need supplementing with quick growing grasses, leguminous crops, etc.

It is stated that in Nairobi town refuse is used, and Sir Albert looks forward to the time when we shall no longer wash away our sewage but shall carry it on to farms and use it for making composts.

This whole question of organic manures is critically discussed by S. H. Jenkins in a recent publication of the Imperial Soil Bureau (Ref. 47).

Losses in making and using farmyard manure.

Dr. O. Lemmermann, who has now retired from the direction of the Dahlem Experiment Station in Germany, has summarized the results of many years of experiments on the making, storing and using of farmyard manure (Ref. 48). Some of these results have already passed into current knowledge, but others are not so well known. The smallest losses of nitrogen (about 13 per cent.) occur in deep feeding boxes, and considerably larger losses (36 per cent.) in ordinary yards or steadings; the figures agree with those obtained in this country. By careful management (especially firm treading), this loss may be reduced to 16 per cent., but under practical conditions, however good, it is difficult to bring the losses below about 30 per cent.

Covering the yards reduced the loss of organic matter but not of nitrogen. No conserving material (*e.g.*, gypsum, superphosphate, or kainit) was of any practical value for reducing loss, the quantities needed to make any appreciable difference being too large to be economical. Nor has any practical success been obtained by the method, proposed by Schneidewind, for conserving nitrogen by so building the heap that it becomes permeated with carbon dioxide. Better results were obtained by making the heap like a potato clamp—long, and with sides and top covered with earth. The loss from a heap made in the ordinary way was 40 per cent. of the nitrogen and 38 per cent. of the dry matter, while from the clamp it was only 11 per cent. of the nitrogen and 17 per cent. of the dry matter. The Würtemburg dungstead of Th. Henkel (which consists of three or four rather small compartments, in each of which dung can be piled up and compacted to a height of about 5 ft. and then covered with earth or boards) is probably effective for reducing loss of nitrogen, though Dr. Lemmermann has not himself tested the question. He is not much impressed with the "hot fermentation" dung or "Edelmist" of H. Krantz, and in support of his view he quotes experiments by Weigert and Fürst, and also those of Niklewski in Poland. He considers that the most practical plan is to make the heap as high as possible rather than low, and to keep it moist and compact.

As to the application of the manure, it should be ploughed in directly it is applied. A delay even of six hours caused a slight loss of yield, while a four-day delay reduced the value of the dung for cereals or roots by 12–14 per cent. There was considerable loss of crop when the dung lay long on the surface before being ploughed in. As between spring and autumn dressings of dung, however, there was little to choose. The liquid manure, when drilled by a special implement so that it was delivered under the surface of the soil, was as effective as an equivalent quantity of nitrogen applied as sulphate of ammonia, but was less effective than this when watered on to the surface in the usual way.

The Responses of Wheat and Barley to Nitrogenous Fertilizers.

The Woburn experiments were designed to test the effects of nitrogenous fertilizers, and give little information about the effects of potash and of phosphate beyond showing that the mixture is beneficial. When the weights of grain and of straw are added together there is remarkably little difference between the yields for wheat and for barley; the difference amounts only to about 10 per cent. and the total weights of the increases given by nitrogen are even closer. But, while the wheat and the barley made approximately the same total growth, they made very different use of the plant substance they built up. The barley put about 45 per cent. of its substance into grain, while the wheat put only about 33 per cent.; these figures showed little tendency to change as the years went by. At Rothamsted the figures have been of the same order, about 50 per cent. of the total produce of barley and 35 per cent. of the total produce of wheat being grain.

Manuring had but little effect on the relative proportions of grain and straw. Nitrate of soda tended to increase the straw slightly more than it did the grain, while sulphate of ammonia and farmyard manure increased both about equally. In the good years there was a tendency for complete manures to increase the straw rather more than the grain. This did not happen where nitrogen was omitted, the grain in this case increasing more than the straw.

This steadiness of the ratio of grain to total produce is another instance of the remarkable stability of the plant under varying conditions of soil productiveness; it makes greater or less growth according to the supply of plant food, but the internal changes are much smaller.

Effect of Nitrogenous Fertilizers in presence of Potassic and Phosphatic Fertilizers. Mean Yields for 15 years, 1877–91, cwt. per acre.

	No Nitrogen.	41 lb. nitrogen per acre.		82 lb. nitrogen per acre.		105 lb. nitrogen in farm-yard manure.
		As nitrate of soda.	As sulphate of ammonia	As nitrate of soda.	As sulphate of ammonia	
	Plot 4.	Plot 6.	Plot 5.	Plot 9.	Plot 8.	Plot 11.
Total produce.						
Barley, cwt. per acre .	23·4	26·7	21·1	37·3	32·3	16·7
Wheat, „ „ „ .	26·2	25·5	22·3	36·1	35·1	16·7
Increment in lb. per lb. nitrogen given in manure :—						
Barley . . .	—	73	61	51	44	18
Wheat . . .	—	70	58	49	48	18
Grain.						
Barley, cwt. per acre .	10·7	10·7	9·4	13·3	13·5	7·7
Wheat „ „ „ .	8·6	8·7	7·6	10·3	11·7	6·2
Ratio of grain/total produce.						
Barley . . .	46	43	45	40	42	46
Wheat . . .	33	33	34	30	33	34

These figures are fairly close to those obtained at Rothamsted over the same period, and this agreement suggests that the nitrogenous fertilizers, in these long-continued experiments, act more or less independently of the type of soil.

In the large number of barley experiments made on ordinary barley-growing farms under the Institute of Brewing scheme, the increment of grain per pound of pure nitrogen supplied in the fertilizer dressing was about 10 to 15, being thus only about one-half the above figures, in spite of the fact that the fertilizer dressing was only 1 cwt. sulphate of ammonia per acre, or about one-half the single dressing given here. The German figures obtained by Lemmermann and by Nolte (Ref. 49) are 17 to 18.

The Woburn and Rothamsted figures correspond to a recovery of about 80 per cent. of the added nitrogen. In rotation practice a more usual figure for cereals is only about 40 or 50 per cent.

Effect of long continued use of Sulphate of Ammonia in making the soil acid and recovery of the soil after treatment with lime.

During the first fifteen years at Woburn sulphate of ammonia behaved very much like nitrate of soda. The effectiveness of its nitrogen, as measured by the increments given over the corresponding plots without nitrogen, and compared with that of the nitrate of soda expressed as 100, was :—

	Barley.	Wheat.
Single dose (41 lb. nitrogen per acre) alone (Plot 2) .	102	116
” ” ” ” ” ” + minerals (Plot 5) .	87	88
Double dose (83 lb. nitrogen per acre) + minerals (Plot 8) .	96	115

After the first fifteen years a change rapidly set in, first on the barley and later on the wheat, and within a few years the yields had fallen very low; finally the crop almost disappeared. The critical point for the barley seemed to be pH5·2, and for wheat pH4·9. Even the weeds went also, with the single exception of spurrey (*Spergula arvensis*), which flourished. The fall was greatest on Plot 2, which was receiving neither potash nor phospate. There is no question that these fertilizers mitigated the worst effects of the acidity, for the plots receiving them continued to produce harvestable crops, even though they might only be of 2 or 3 bushels per acre, long after Plot 2 had become what looked like a mere mass of spurrey.

Although the barley plants seem to disappear on these acid plots at Woburn, they do not really do so. The seed germinates and the seedlings duly appear. The root system, however, remains very stunted, while the individual roots are very thick and carry only a few root hairs; the leaves quickly become reddish at the tips and at the base of the sheath; later they change to yellow, and soon they cannot be distinguished in the thick growth of spurrey that covers the whole plot and attains a height of about 9 inches. From April onwards no barley can be seen. Careful search among the spurrey shows, however, that the barley is still alive and going through its normal stages. Although the plant is only 8 or 9 inches high, it ripens and produces tiny heads of diminutive grain, at about the same time as the normal plants on the adjacent plots. These Lilliputian plants are very curious and are now being studied in detail; they are probably the smallest barley plants ever produced.

The three symptoms—patchiness, restricted root system with marked lack of root hairs, and stunted growth—are now recognized signs of soil acidity, enabling the soil expert to pick out at once those fields which require fuller examination with the view of supplying lime. In spite of the fact that the plant is profoundly affected by the acidity, certain characters show little, if any, change—at any rate in the less extreme cases of acidity where growth is still sufficient to allow the grain to be harvested. Neither the percentage of nitrogen in the grain nor the ratio of grain to total produce is appreciably different on the acid plots from what it is on the others, although the yield may only be 2 or 3 per cent. of the normal.

The Effect of Lime.

When it was recognized that the falling-off of yield was due to acidity, the plots were subdivided and parts were treated with lime. A dressing of 1 ton per acre raised the yield to the level of the nitrate of soda plots and kept it at that level for some eight or ten years, when a fall set in again. A second dressing, also of 1 ton per acre, raised the yield again to the nitrate of soda level and kept it there. A dressing of 2 tons per acre produced no better effect than 1 ton, but a repetition of the dressing was more effective and gave a higher yield for two or three years than nitrate of soda; afterwards, however, the yields were the same.

At this rate 112 lb. lime was enough to neutralize the effect of 100 lb. of sulphate of ammonia; a figure which is practically the same as that obtained by Hudig in his Dutch experiments.

Small dressings of lime at the rate of 5 cwt. per acre produced rather remarkable effects. For several years they kept the yield well above that for sulphate of ammonia alone, though not as high as when 1 ton of lime was given. Three dressings were given between 1909 and 1912, amounting in all to 15 cwt. of lime per acre, and although, owing to variations in yield from year to year, it is not possible to say how long the effects of the lime did persist in the soil, it is safe to say that they lasted for at least ten years. These small dressings certainly seemed to be more economically utilized than the larger ones, though they had given smaller yields, and in any question of compensation for liming the quantity of the dressing and the "lime status" of the soil should apparently be taken into account in assessing the rate to be allowed per ton of lime applied. A ton of lime lasts longer on a very acid soil than on a nearly neutral one.

The wheat plots showed another interesting result. During the first few years of acid conditions, and before the acidity had become too pronounced, sulphate of ammonia was unusually effective, and distinctly better than nitrate of soda. Then came the fall.

Assuming that the result was really due to the sulphate of ammonia, there seem to be two possible explanations. On the one hand we may assume that the marginal degree of acidity, *e.g.*, the degree that just precedes the injury, definitely stimulates the growth of plants. This idea is supported by the patchy appearance of a crop which is just beginning to suffer, in which circumstances some of the plants grow unusually well while others almost fail. On the other hand, the additional growth may be associated with the fact that one of the most important fungus diseases of wheat at Woburn, "Take-all" (*Ophiobolus graminis*), is severely checked by soil acidity, so that, over a certain range of acidity, the wheat plant can still grow well while the fungus cannot. A further possibility is that the soil acidity may retard nitrification in the autumn and so reduce the loss of nitrate during winter. There is also evidence that ammonia may be more effectively and rapidly utilized by plants than nitrate ; in normal conditions plants have but little opportunity of obtaining ammonia because of the rapid bacterial nitrification, but under these marginal conditions nitrification may be so far slowed down as to give the plant this opportunity.

THE EFFECT OF SEASON ON THE YIELDS OF WHEAT AND BARLEY.

During the fifty years of the experiments the yields have varied by as much as 50 per cent. Wheat and barley tended to vary in the same way—a season that was good for one was good for the other. At Woburn, however, the yield of wheat was more variable than that of barley, while on the heavier soil at Rothamsted barley has been more variable than wheat. A further difference is that nitrogenous manures steadied the yield of barley, while minerals did not ; while for wheat it was the potash and phosphates rather than the nitrogenous manures that steadied the yield.

Probably the most interesting result of the whole examination has been to show that the manuring considerably influences the effect of season on the crop yield.

The variation in yield (measured by the percentage annual variation) was least for the crops receiving farmyard manure or complete artificials, greater on the plots receiving incomplete manure, and still greater on the plots that had become acid. The complete manure and the farmyard manure not only gave larger crops but steadier yields.

The average rainfall at Woburn, 24·2 inches per annum, of which 10·6 fell in the six months February to July, was ample for the needs of both barley and wheat as grown there, and more than an average rainfall did harm rather than good. Woburn, with its light sandy soil, might ordinarily be regarded as liable to suffer in dry years. Actually the evidence points the other way ; both for wheat and barley it was in the wetter rather than in the drier years that these crops suffered. One is reminded of the old proverb : Drought never bred dearth in England. The harmful effect was particularly pronounced when the excess rain fell in the spring months. The average of 4·5 inches falling in February, March and April (approximately 1·5 inches in each) seems to have been more than enough. The time of maximum injury from rain, and the extent of the damage, depended on the manuring ; inspection of the curves shows that for barley the maximum effects occurred at the following periods for the respective plots :—

February–April	Plots 1, 7, 4	No nitrogen.
January and July	Plots 6, 9	Complete artificials.
Benefit in October prior to sowing, injury in January	Plots 11*b*	Farmyard manure.

In a wet spring farmyard manure made matters worse rather than better both for wheat and barley. Apparently its power to hold moisture, so valuable under many conditions, is either unwanted or positively harmful in a wet spring. But there was no evidence that farmyard manure had any special advantage in dry springs over nitrate of soda or sulphate of ammonia. This is, of course, contrary to the general belief.

Also there was no evidence that nitrate of soda had been more effective after a wet spring than after a dry one. Sulphate of ammonia appears to have been less effective than nitrate of soda in years when the spring was dry, but better in years when it was wet.

Another period when rainfall appears to have had a marked effect on the yield of barley is during the third month of growth, sixty to ninety days after sowing. In this period (the average is May 24th to June 22nd) the plant was making its most rapid growth and therefore its heaviest demands on the soil moisture; apparently all of the average rainfall (2·23 inches) was needed. For most plots this quantity was enough, and any higher rainfall was harmful; but the two plots receiving the double dressing of nitrate of soda and sulphate of ammonia, and making the heaviest growth, required more rain; they responded to another half-inch.

Deficiency of rain at this period seems to have been harmful, so that the average seems also to have been the optimum rainfall. Farmyard manure is shown to have been better than nitrate of soda in the dry Junes, whereas in the dry springs this had not been the case.

The Nitrogen-content of the Grain.

The nitrogen-content of the grain is an important factor in determining the quality both of wheat and barley, but from the farmer's point of view the quality of barley is more important than that of wheat. At Woburn, the nitrogen-content of the barley is usually high and (as at other centres) is only slightly affected by manuring; it is slightly raised by nitrogenous manures and slightly lowered by potash and phosphates, but the effects are very small, and in any case they cancel out in the complete mixture necessary for barley grown in these conditions.

Unlike the yield, the nitrogen-content of the grain has shown no tendency to change as the years have passed by. This is a rather different result from that obtained on Hoos Field, Rothamsted, where, as deterioration of yield progressed, the nitrogen-content of the grain tended slightly to rise.

The variations in nitrogen-content from year to year were much less than those for yield, being only from 10 to 15 per cent., while those for yield were of the order of 40 to 50 per cent.

The effect of rainfall on the nitrogen-content of the grain was simpler than that on the yield. The most critical rainfall period for nitrogen-content was May, June and July; indeed, 1 inch of rain above the average at the beginning of June lowered the nitrogen-content by about 0·10 per cent. Curiously enough this June rainfall, which was so important for nitrogen-content, had little effect on yield, while the March-April rainfall, which depressed the yield, had little effect on the nitrogen-content, tending, if anything, to raise it.

This close connection between early-summer rainfall and nitrogen-content of grain has not been confined to Woburn, but was found also at other centres, where the Institute of Brewing barley experiments were made. The explanation probably is that nitrate taken up by the plant after its first few weeks of growth tends to raise the nitrogen-content of the grain rather than to produce more grain. Early summer rainfall, by washing out the late-formed or excess nitrate from the soil, prevents this rise in nitrogen-content. It is often stated that rainfall in July and early August plays an important part in lowering the nitrogen-content, but there is no evidence for this. It may still be true, however, that the nitrogen-content is lowered when July is wet because low temperature tends to reduce nitrogen-content, and a wet July is often also a cool one. The maturation and therefore the quality of the grain may, however, be improved by July rain.

Up to the middle of May (*i.e.*, for the first eight or ten weeks after sowing) variations in temperature had but little effect on the nitrogen-content of the grain, except for a slight lowering with a rise in temperature confined to those plots that received complete artificials.

From mid-May on till harvest, however, temperatures above the average raised the nitrogen-content. The effect depended somewhat on the manuring—differing in this respect from the rainfall effect; it was least pronounced on the farmyard manure plot and most marked on that receiving nitrate of soda.

Forecasting of Nitrogen-content.

The nitrogen-content was so closely connected with early summer rainfall and July temperature that a "forecast" of the nitrogen-content of the grain over the whole period was constructed from a knowledge of these two quantities. No fewer than 75 per cent. of the predictions came within 0·15 per cent. of the values actually found. Of course it does not follow that the same equation will continue to fit the points in the future, and if there had been 100 years instead of forty the equation might have been different. Nevertheless, the fact that it holds for forty years opens up some interesting possibilities, for, as Bishop has shown, a forecast of the nitrogen-content also enables a forecast to be made of the general chemical composition of the grain and of the quantity of malt extract which it can be made to yield (Ref. 50).

Effect of Cultural Operations.

Date of Sowing.—February was in general the best month for sowing barley at Woburn, and although later sowings have not greatly affected the yield—no doubt because the seed-time was well chosen—they have been accompanied by a tendency to higher nitrogen-contents. Each week's delay after the end of February has meant an addition of something like 0·05 per cent. to the nitrogen-content of the grain. In the Institute of Brewing experiments on barley grown in rotation, delays in sowing also increased the nitrogen-content of the grain.

Effect of Fallowing.

One of the most remarkable results obtained at Woburn was the extraordinary effect of fallowing in raising the yield of the succeeding barley crop and lowering the nitrogen-content of the grain.

Nitrogen in Wheat Grain.

The causes of fluctuation in nitrogen-content seem to be much the same for wheat as for barley, but they act differently on the two crops.

For both crops the nitrogen figure was raised by nitrate of soda and lowered by minerals applied in addition. Years of high nitrogen-content for barley tended also to be years of high nitrogen-content for wheat, but the figures were not closely related. As in the case of barley, the nitrogen-content tended to be lower in years of high yield and *vice versa.* For both crops too, rainfall acted in the same direction, though not to the same extent. Additional rain, if it fell in March, tended to raise the nitrogen-content, but if it fell during the actual growing season (May-June) to lower the nitrogen content. But there was a difference between the crops in their behaviour to rain falling towards harvest time. Additional rainfall in early August, which had no recognizable effect on the nitrogen-content of barley, distinctly raised that of wheat. High July temperatures tended to raise the nitrogen of barley but not that of wheat.

Bushel Weights of Wheat and of Barley.

Manuring had a perceptible though not great effect on bushel weight. The average values on the plots without nitrogen were below the general mean, and those on the plots receiving sulphate of ammonia were above it. Complete artificials gave higher bushel weights than incomplete, and sulphate of ammonia gave higher weights than nitrate of soda. But the differences were in all cases small.

The bushel weights did not vary with the yield; there was nothing to show, as is sometimes assumed, that in years of low yields the bushel weight was also low. Moreover the bushel weights were not related to the quantity of tail corn; increased proportions of tail corn did not, as is often stated, mean lower bushel weights. Further, the values showed no steady deterioration as the years passed on. For the last twenty years they were certainly lower than for the first thirty, but the change came rapidly at the time of changing the manuring; there was no sign of a fall within either period.

No definite relations were traced between weather conditions and bushel weight, but the fluctuations were too small to justify any detailed examination. The changes in bushel weight bore no relation to the fluctuations in nitrogen-content of the grain. The only factor showing any resemblance in its fluctuations to bushel weight was the ratio of grain to total produce.

Thousand-corn Weight of Barley.

The thousand-corn weight of barley at Woburn has generally been rather below the average of good malting samples. Manuring has had no recognizable effect. In any particular year the values were all practically alike, showing no variation according to the particular treatments.

Season, however, clearly had a marked effect, as the values varied considerably from year to year, though curiously enough none of the meteorological factors at the time of grain formation or ripening had any recognizable influence. In fact, no connection could be traced with rainfall, hours of sunshine, or temperature in May, June, July or August. Temperatures above the average in March and April tended to increase the thousand-corn weight, but in no month did sunshine have any recognizable effect; this was quite contrary to the usual statement that "June sun fills out the grain."

Again there was no connection between the thousand-corn weight and either the nitrogen-content of the grain or the ratio of grain to straw.

Effect of Sheep Folding on the Land: Swedes and Sugar-beet Tops.

The Woburn experiments give considerable information about the effect of folding sheep on the land. The effect of feeding some 3 to 5 tons of swedes per acre, along with cake or meal, to sheep folded on the land was to add some 10–12 bushels per acre to the succeeding crop; this was approximately the same as the effect of 22 lb. nitrogen per acre added as fertilizer. The manurial value of sugar-beet tops was found at the Norfolk Agricultural Station (Ref. 51) to be approximately the same whether they were folded to sheep or ploughed in—10 bushels per acre was added to the yield of the following barley crop. A result of the same order was obtained from 20 lb. nitrogen added as sulphate of ammonia. Apparently the manurial value of beet tops was a little better than that of swedes, though it was impossible to judge whether this was a real difference. As at Woburn no residual effects were seen in subsequent years. It is remarkable that the Sprowston figure should be so near to that obtained at Woburn.

MINOR ELEMENTS IN PLANT NUTRITION.

In 1923, Miss K. Warington at Rothamsted proved definitely for the first time that a minute quantity of boron is essential for plant growth, and this result has already found applications in practice. Various crop diseases previously regarded as incurable have now been traced to a lack of available boron; notably a heart rot in sugar beet and swedes, "Internal cork" in apples in New Zealand, and "Top rot" of tobacco (Ref. 52). These diseases may occur even when compounds of boron are present in the soil, but presumably in these cases the boron is unavailable, because the diseases may be cured by addition of a small quantity of borax.

The heart rot or crown rot of sugar-beet has been known on the continent for many years, and has appeared from time to time in the beet fields of this country. The trouble is associated with dry open soils that have been well limed or are calcareous by nature, and it is most conspicuous in dry seasons. On the continent the trouble was recognized as occurring most frequently on land that had been over-limed for years, a condition not uncommon on farms adjoining the sugar factories, and using large dressings of the factory waste lime. The symptoms of the disease are the blackening and death of the central leaves, followed by the development of secondary crowns which give the plant a tufted appearance; finally, the crown of the root decays, leaving areas of black diseased tissue that are readily noticed when the beet is topped. In bad cases both the yield and sugar percentage are seriously reduced. Continental workers have found that the trouble is caused by the plant's inability to obtain from the soil the minute trace of boron compounds that it requires, and that, if a small dose of borax is added to the soil, the disease is cured. English experiments have recently been summarized by F. Hanley and J. C. Mann (Ref. 53); experience in Scotland (Ref. 54), Wales (Ref. 55) and the Irish Free State (Ref. 56) has also been recorded, and the general conclusion is that a dressing of 20 lb. per acre of borax is an effective cure. Even distribution, which is essential, can be effected either by mixing the borax with four or five times its weight of sand, so as to raise the total application to 1 cwt. per acre, or by arranging with the manure merchant that the borax should be thoroughly mixed with the fertilizer. Borax should be treated as a medicine, not as a food; no more than is necessary should be given—any excess may be very harmful.

The elements so far known to have stimulative and curative effects on plant growth are boron, copper, iron, manganese, zinc and possibly cobalt and aluminium. Of these, boron, iron, and manganese are essential under all conditions; absence of any of them shows itself in the cessation of some vital process and usually by the appearance of definite disease symptoms. Copper and zinc are apparently curative in their effects, for under certain soil conditions plants seem specially liable to particular physiological diseases curable by these elements. It is not known whether the action is to cure the diseased cell or to put out of action some toxin produced in the soil.

Although necessary in small amounts, these elements are all very harmful in larger concentrations. Their use in horticulture and in agriculture has therefore to be very carefully controlled.

Manganese. Diseases curable by small dressings of soluble manganese salts have been found in several countries and on a number of different crops. They usually occur on fen soils, reclaimed swamp soils or those containing much calcium carbonate. The best known are the grey-speck disease of oats, a disease of beet in Holland, chlorosis of spinach on Long Island and diseases of tomatoes and other crops on the Everglade soils of Florida, although in the last case deficiency of copper as well as of manganese appears to be concerned. Marsh spot in pea seeds may be another manganese deficiency disease (Ref. 57). In general, dry conditions aggravate the diseases and also any manurial treatment, such as liming, which tends to make the soil more alkaline. The remedy consists of adding some 40–50 lb. manganese sulphate per acre. Various methods have been devised for ascertaining whether a soil is deficient in manganese (Ref. 58) or whether it is likely to become so after liming.

Copper. The instances where copper salts have proved beneficial to plant growth in field conditions are all associated with soils rich in organic matter (Ref. 59). On a calcareous peat soil in the Florida Everglades marked increases in the yields of various market-garden and other crops followed the addition of 50 lb. per acre of copper sulphate. There were no disease symptoms; the effect appeared to be a direct feeding of the plant, and the result was the same whether the copper sulphate was applied to the soil or to the leaves of the plant (Ref. 60).

Similar effects have been observed in Poland. R. Kwiecinski (Ref. 61) showed that additions of copper sulphate at the rate of 40 kg. per ha. (38 lb. per acre) trebled the yield of oats on a peat soil.

In other cases definite physiological diseases occur unless the copper salts are given. On newly reclaimed peat or moorland soil, plants are liable to turn yellow and the tops of the leaves to become white and die. The disease is well known in Holland and Germany, where a good deal of reclamation is going on, and is called "Urbarmachungskrankheit" or reclamation disease; it affects especially summer cereals, sugar beets and leguminous crops.

Grassland farming on these soils proved almost impossible; in the second year after the grass had been sown all the grasses disappeared with the exception of Yorkshire fog, which was not affected.

Fruit trees are also affected. In almost all countries where citrus fruits are grown on soils containing much organic matter the trees suffer from the dying of the tips of the branches, the leaves and the fruits. The disease is called "die-back," or Exanthema (Ref. 62). Anderssen (Ref. 63) has also described a chlorosis of fruit trees in South Africa which he attributes to deficiencies of copper.

Zinc. Fruit and nut trees in parts of the United States (California, Northern Central Florida and elsewhere) suffer from various physiological diseases; mottling of leaf, "little leaf," or "rosette," and dying back of the growing tips. Ferrous sulphate was tried as a remedy, when it was found that some samples, used in large enough quantity, were effective, while others were not. Chandler, Hoagland and Hibbard (Ref. 64), in California, observed that the purer samples were least effective, while others containing zinc sulphate as an impurity acted much better. Quite independently, Alben and Cole (Ref. 65), of the Dept. of Agriculture, observed that iron sulphate was successful in their small-scale tests but not on the large-scale, and the difference was traced to the use of galvanized iron containers in the former but not the latter. Both sets of observers, therefore, tried zinc sulphate and found that it cured the disease. E. R. Parker, of the University of California, has further developed the use of zinc oxide for citrus fruits, applied either as a dust or mixed with the sprays.

Iron. Usually soils contain sufficient iron for plant requirements (Ref. 66), so that additions are needed only for the water or sand cultures of plant physiologists; occasionally, however, soils carry a chlorotic vegetation which becomes normal after iron salts have been added. Deficiency of iron in the herbage in the Rotorua region of New Zealand was regarded by B. C.

Aston (Ref. 67) as the cause of a disease known as Bush sickness affecting cattle, and, to a less extent, sheep. "Pine," a disease of sheep and young cattle in certain Northern regions of Great Britain, is attributed to the same cause (Ref. 68). T. Rigg and H. O. Askew (Ref. 69) show, however, that iron deficiency is not the only factor. An acid extract of healthy soil cured the disease, but the efficacy of the extracts was not governed by their iron-content.

Cobalt. In Australia, some of these obscure animal diseases are attributed to deficiency of cobalt in the vegetation (Ref. 70), and the point is also under investigation at the Cawthron Institute, New Zealand. There are a considerable number of possibilities, and it is exceedingly difficult to decide between them.

Plant or Animal Poisons in Soils.

Detailed examination of certain infertile soils in the United States has shown that various previously unsuspected substances in the soil can at times do considerable harm. Selenium is an element somewhat like sulphur, but more harmful to animal life; it was at one time regarded as rather rare, but is now known to be fairly common. Plants take it up from the soil and although it does not injure them it can cause considerable harm to animals feeding thereon. This was first observed in South Dakota; grain and other vegetation grown in certain regions produced in animals toxic symptoms different from those of fluorine, lithium or oxalic acid. Selenium was suggested as a possible cause and it was found. A detailed investigation by H. G. Byers (Ref. 71) showed that extensive areas of cretaceous shales in the dry Western States were rich in selenium and that this passed into the plant in sufficient quantities to injure the animals feeding upon it.

Chromium and nickel are regarded as the cause of infertility of certain soils in the United States (Ref. 72).

ROOT RESPIRATION.

Agriculturists have long been familiar with the fact that water-logged soils are bad for plant growth; the injury is due to lack of air for the roots. The distinguished American physiologist, Loehwing (Ref. 73), has recently studied the effect of further improving the aeration of the soil. He found that continuous aeration of sand or soil cultures of sunflowers and soya beans led to the development of a large root system, more fibrous and branching, with thicker cell walls and more reserve carbohydrate. The tops were larger, more vigorous and the leaves were darker green in colour. Root aeration is particularly important during the reproductive phase, and favours the setting and development of fruit (Ref. 74).

Root respiration is closely connected with uptake of water and of plant food. With fuller aeration, the plant foods were more rapidly taken up; the initial absorption of potassium and magnesium was much hastened, while the absorption of calcium and phosphorus, though less accelerated, continued longer, and the final percentages of calcium, phosphorus, potassium and total ash in the plant were increased.

Some years ago A. Howard obtained remarkable crop increases in India by putting potsherds into the ground, so increasing the amount of soil aeration and providing the roots with more oxygen. A similar experiment has been made by Bushnell (Ref. 75) on potatoes at Wooster, Ohio. The soil is a heavy loam, and gives poor yields of potatoes. When, however, large dressings of sand were applied to lighten it, or when perforated tiles were let into the ground just below the sets, the yield went up considerably. The effect of the tiles is particularly interesting. The results were, in tons per acre[1] :—

	Yield—tons per acre.	
	1933.	1934.
Ordinary cultivation (no tiles) .	9·4	8·9
Land aerated by plain tiles .	10·7	9·7
„ „ „ perforated tiles .	11·2	10·7

LAND RECLAMATION AND AGRICULTURAL DEVELOPMENT ON THE CONTINENT.

Although land reclamation is almost at a standstill in this country, much is going on elsewhere. In Holland the draining of the Zuyder Zee, described in an earlier Report, is to be resumed. In Italy there has been great activity. One of the largest of the Italian schemes has been recently described by Dr. Robert Almagia (Ref. 76). He shows how the vast Pontine Marshes have been converted from malarial swamps into good farming land. The present writer visited this region in April, 1934, and was greatly impressed with the efficiency of the work and the adequacy of the houses and farm buildings. Hitherto it has been difficult for English experts to obtain information on the many administrative and financial problems involved. These are satisfactorily dealt with in a new book (Ref. 77) by Senor Cesare Longobardi, so that we now have a full account of the procedure and some statement of the cost of the work.

Reclamation has progressed rapidly since the Fascists came into power. In their first years of office, some 5,000,000 man days were given to this work; in 1933–34, their twelfth year of office, this had increased to nearly 18,000,000 man days. Some 12 million acres are already in hand or completed, and marked increases in output of agricultural produce have already been obtained. The production of wheat, which before the War was less than 5,000,000 metric tons per annum, has risen to nearly 7,000,000 metric tons per annum; net imports of wheat, formerly 1·4 million tons per annum, fell in 1934 to 235,700 tons only.

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[1] (In the United States potatoes are measured by bushels per acre (1 bushel = 60 lb.) and the figures are so given in Bushnell's paper.

The Italian reclamation schemes extend also to land which, although cultivated, is not properly utilized, especially to the well-known latifunda, agricultural properties on which farming is extremely primitive and extensive.

The general machinery for the reclamation is prescribed by the Mussolini Act, which characteristically, as the author states, "does not lose itself in the maze of existing measures. It leaves them as they are and goes straight forward." It makes financial provision over a period of fourteen years for work amounting to 7,000,000,000 lire (roughly £110,000,000); it directs special attention to works nearing completion; and it opens the way for further developments which experience may suggest. Of the 7,000,000,000 lire, 4,300,000,000 is to be chargeable to the Treasury and the remainder to the land owners. The major part of the finance is provided in the form of thirty-year annuities discounted to the parties concerned by several different institutions.

Fairly full details are given in regard to the larger schemes. The great Pontine Marsh is cut up into holdings of 25–75 acres according to the quality of the land, each furnished with a house, stabling for ten cattle, a poultry run, pig sty, well, etc. The Ex-Service Men's League has obtained grants for the settlement of some 100,000 acres. Families are brought by the Commissariat for Internal Migrations; as they have no capital, the farms are taken from the League on a crop-sharing plan, the tenants receiving monthly advances in cash and in kind from the league, which directs the management of the farm. When the head of the family has acquired the necessary experience and has returned the advances made by the League, an agreement is to be drawn up under which he will purchase the farm and the live stock from the League in fifteen annual instalments covering capital and interest at the official bank rate. The farms are grouped in batches of 130, around each of the three new towns, Littoria, Sabaudia and Pontinia. An expert adviser is available. The cost of the scheme is estimated at £45–£160 per acre; the purchase money amounts to annual payments for fifteen years of sums varying from 30*s*. to £4 per acre, in addition to an annual payment of 8*s*. per acre as cost of upkeep and amortization of the drainage works. These repayments, however, do not cover the Government contribution, but only that made by the concessionaires. There is a similar but somewhat smaller reclamation scheme in the lower Piave region running towards the Adriatic, and others on the Brisighella in the Lower Apennines, the Sele Plain, the Tirso, etc. There is no question that the Italians mean to develop their country to the utmost.

The Russian agricultural development schemes have recently been described by several authors, two of whom deserve special mention. Dr. Mikhayla gives a glowing account of them in his book, *Soviet Geography* (Ref. 78). "The corn problem is solved," the author says, "Capitalist elements in the U.S.S.R. have been stamped out. . . . Agriculture in the U.S.S.R. is conducted on a larger scale than anywhere else in the world." The tables set out the official figures and show a cultivated area in 1934 of 330 million acres and an output of 14·8 "billion roubles," an average of forty roubles per acre. If one can assume the purchasing power of the rouble in 1934 was as much as 6*d.*, this output per acre is about one-eighth of the average for England and Wales.

It is, however, owing to the wide differences in natural and economic conditions, very unfair to institute comparisons between the two countries.

The other book by J. G. Crowther (Ref. 79) describes the organization of the research institutes which are playing a great part in the development of modern Russian agriculture. The Academy of Science is at the head; it makes its five-year plan of scientific investigation, which the Institutes then carry out. The individuals working at these institutes may discuss among themselves how best to perform their allotted tasks, but they cannot strike out a line of their own, independent of the Academy's instructions.

The organization of these Institutes is completely different from anything in this country. There are frequently three leaders: the director, the secretary of the Trades Union to which the members of the Staff belong, and the secretary of the group of Communists, or the "Party Cell," in the laboratory. The Communists (called simply "the Party") are not numerically strong; Mr. Crowther instances an Institute where, out of 330 members of staff, only thirty-four are members or candidates for membership of the Party. But their power is such that no director dare go against their wishes. Everywhere the staff are young, mostly under thirty, few over forty-one years of age. Frequently the workers engaged on a particular problem are organized in a brigade, which holds meetings and adopts other devices to foster the collective spirit and to carry out their allotted duties according to plan. The different brigades enter into "socialistic competitions" with each other to see which can do the best or the quickest work. "The personal desires of the individual members of a brigade," says Mr. Crowther, "receive little consideration."

The numbers of people engaged are enormous. Crowther describes, among others, N. I. Vavilov's Plant Research Institute at Leningrad, now being transferred to Moscow. One branch alone of his work requires 1,800 assistants; another requires 2,000. It will be interesting to see what results emerge from this colossal organization.

In Germany a great campaign is being developed in favour of "The freedom of the people's food," which really means national self sufficiency—production of all the nation's food within the national boundaries. "Back to the land" is the watchword and men are to be bound to the soil through the awakening and nourishing of their instinct for possessing a little land of their own. A great exhibition—the third of its kind—was held in 1936, in Frankfurt, for the purpose of emphasizing the national aspects of this policy. It was not an ordinary agricultural show, but designed rather to demonstrate the various aspects of a farmer's work and a farmer's life. The organization of agriculture is utterly different from that in Russia or in Italy, but it is being carried out with great skill.

This policy of extensive land development is supported by a restriction of imports which has naturally led to a rapid rise in internal prices. The prices of wheat, meat and dairy products in Italy, France and Germany are from two-and-a-half to three times the corresponding world prices. The imports of beef into European countries (excluding the United Kingdom) fell from 475·2 thousand tons in 1925 to 103·1 thousand in 1933. Germany's imports of meat and dairy produce have shrunk greatly, as is shown by the following figures:—

GERMANY'S IMPORTS OF CERTAIN FOODS.

	1925.	1927.	1929.	1931.	1933.
Meat	160·3	150·9	81·5	2·6	0·6
Butter	965	1,082	1,354	1,001	591
Cheese	730	706	643	513	395

Of course, all this restriction of imports by European countries has meant a considerable diversion of foodstuffs on to our own market (Ref. 81), and although this might appear at first sight detrimental to the English farmer, it has been an important factor in ensuring abundant supplies of cheap food which have contributed largely to internal peace in this country. In recent years I have met a good many continental farmers, and I am quite certain that, with all their protection, they are less well off than our own; they have trouble and anxieties from which we are free.

Land Improvement in Great Britain.

Although no spectacular developments are taking place, there is a good deal of quiet improvement going on in this country. In Norfolk, thanks to the pioneering work of Mr. H. Goude, fruit and vegetable growing have greatly expanded during the past fifteen years, much of it on the light soil which used to be very poor agricultural land. Currant bushes, asparagus and other crops are now flourishing where only poor field crops used to be seen. In Suffolk, Sir Bernard Greenwell is "cragging" the soil and so changing it from an almost derelict condition to good farm land. Other instances could be given.

Soil Surveys in Great Britain.

For many years now soil surveys of parts of this country have been quietly going on, but only rarely are any published. The excursion to Great Britain of the International Society of Soil Science in August, 1935, was made the occasion for publishing surveys for the regions they visited (Ref. 82). Uniform publication of the whole of the surveys, however, is very desirable.

A Land Utilization Survey, organized by Prof. Dudley Stamp, of the London School of Economics, has been more fortunate. Not only is the work well on towards completion but arrangements are in hand for uniform publication. A number of maps are already issued and the first of the County Reports—that for Berkshire, by J. Stephenson (Ref. 83)—is now out.

The author shows that the best arable soils are on the Corallians, the Upper Greensand, the chalk rocks, and the clays. On the other hand, the Reading and the Bagshot beds give poor arable soils. The valley gravels are going out of agriculture and being "developed" for residential purposes. An interesting point made by Mr. Stephenson is that cheap and easy transport (*e.g.*, improvement of by-roads) has encouraged dairy farming but discouraged the ploughing of smaller fields, for feeding stuffs become cheaper to buy than to grow.

Native Agriculture in the British Empire.

Space does not permit of any account of the numerous problems connected with native agriculture in the British Empire, but reference must be made to the Heath Clark lectures, in which Sir Daniel Hall (Ref. 84) discussed problems of African agriculture in relation to the feeding of the native population and the export of planter's products, such as oil, fibres, etc. The present native methods are very wasteful; they depend on "shifting cultivation," in which the land is broken up and used for a time, then left to go wild again. The stocking of the wild grassland is commonly too heavy, and erosion sets in as a result. No rotation has been envolved, as happened in Europe, nor has the native ever learned the proper use of dung or of human excrements as manure. Sir Daniel recommends an extensive use of the Indore composts in order to enable the native to fix his cultivated areas, and the elimination of overstocking by the organization of cattle and meat markets.

SOIL EROSION.

Over large parts of the Continental areas of the world serious losses have been caused through the breaking up of prairie land and converting it into arable land. The process was very profitable for those who did it; fertility that had accumulated during long years of natural vegetation was suddenly released and cashed in a few years. After that, however, the land gave out. It is not so much the fertilizer elements that go: they could be replaced by manures. The seriousness of the situation arises from the fact that the soil texture breaks down. The crumbs held together by the fine rootlets of the natural vegetation fall to dust when these rootlets decompose and disappear in consequence of the ploughing up. The land then becomes peculiarly susceptible to erosion either by wind or by torrential rain, both of which are liable to occur in the dry regions.

The drought in the United States has directed special attention to this problem, which is one of the most difficult in agricultural science, and has not yet been solved. For the third time in six years there has been drought in the American wheat belt: in 1930, 1934 and 1936. Sixteen States have been affected, especially the Dakotas, Minnesota, Montana, Wyoming, Missouri, Nebraska and Kansas. Crops have withered and live stock have died for want of water: by mid-July, 1936, it was estimated that the drought had already cost the country some 60 million pounds.

Part of the trouble arises from the clearing of forests. One hundred years ago there were over 800 million acres of forest in the United States; now there are less than 500 million acres. The soil has lost its natural protective cover, and is readily washed away by the torrential rain that is liable to fall in the semi-arid regions.

Part of the trouble also arises from overstocking. Pasture lands that were once rich have been overstocked (as in parts of the British Empire), and this is one of the surest ways to soil erosion.

But the most serious cause is the ploughing up and constant cultivation, the alternate cropping and fallowing, which have been practised ever since the modern intensive exploitation began.

The net result is startling. The New York correspondent of the *Times* (Ref. 85) reports that some 100 million acres of land in the Western States have been used up: their fertility is cashed and there is no sign that they can be cultivated again. Another 169 million acres have already lost most of the top soil by wind erosion, while nearly 800 million acres have lost some top soil, and may soon lose it all. A striking passage is quoted from a recent Report of the National Resources Committee: "Most of the territory occupied by the United States is not naturally suited for a permanent civilization. It is like the land of the Mayas of Yucatan or the land of Babylon—a rich country where civilization can flash into a blaze of glory and then collapse in a few generations into ruin. Our soil is not enriched by the usual methods of cultivation, but impoverished. By the normal processes of our farming, our mining, and our lumbering we create a desert. Americans need to realize that all other national hopes and aspirations are secondary to the question whether we can continue to eat. . . . Any nation whose land naturally turns into a desert must either take measures to preserve the land or it will surely die."

The only certain remedy known at present is to induce grass or other vegetation to grow and give a protecting cover to the surface, and so build up once more a good crumb structure of the soil itself. But the difficulty of starting vegetation on any adequate scale has not yet been solved. Experimental stations have been set up and much work has been begun, but the task is formidable.

Rubber in Malaya.

Special reference must be made to a paper by W. B. Haines and Evan Guest (Ref. 86) describing the results of recent well-conducted manurial experiments on rubber in Malaya. The conclusions are as follows :—

1. For mature rubber, nitrogen is usually the only element required for rejuvenation by manuring. Organic forms of fertilizer have not justified their extra cost over sulphate of ammonia during the period of five years.

2. Yield response may be rapid in rubber which has been backward, if it is still fairly young, but in old rubber response is usually slow. Two stages of recovery may be noticed, the first being associated with the quick recovery of foliage and the second with the slower improvement in bark. Expenditure may result in profitable returns in from one to seven years, and during this time the capital value of a stand is much enhanced.

3. It is shown that the economic value of manuring depends not only on the arrest of deterioration, but also in bad cases upon definite movement of yields towards recovery.

4. The growth-rate of the trees provides a useful criterion for judging the degree of starvation and the frequency of application required. It is tentatively suggested that quick response is likely to be obtained where the growth-rate of the trees has fallen below a standard girth-increment of half an inch per year.

5. Young rubber on replanted sites will seldom do well without manuring, and mineral elements are required to support nitrogen. Complete fertilizers should, therefore, be given until it can be proved whether one of the mineral elements can safely be omitted.

GENERAL.

A detailed study of the soils of France has been published by V. Agafonoff (Ref. 87) along with a soil map. A considerable number of analyses are given, and the publication may be commended to all soil experts. The soils of Germany and of Danzig have been fully described and mapped by H. Stremme, and a valuable account of them is published (Ref. 88).

Waste of Fertilizer Material in Sewage.

So much is written of the wastefulness of our sewage methods that an estimate of the amount of fertilizer material actually lost in the sewage of Berlin is of interest (Ref. 89). The quantity of sewage is about 160 litres (32 gallons) per head per day. The total amount of phosphoric acid (P_2O_5) is about 4 grams per day, *i.e.*, 1 oz. per week; in a year, therefore, the amount per head of population is 3¼ lb., equivalent to about 14 lb. superphosphate, so that in the course of eight years the sewage corresponding to one individual contains the equivalent of 1 cwt. superphosphate. English estimates are of the same order, and they show that the sewage per individual for eight years also contains the equivalent of ½ cwt. muriate of potash and 4 cwt. sulphate of ammonia. It seems clear that human beings are not very effective as manure making machines, but on the other hand, there are large numbers of them, and the figures, when multiplied by the total population, become considerable, amounting for Great Britain to no less than 250,000 tons of superphosphate and 125,000 tons of muriate of potash annually.

E. J. RUSSELL.

Rothamsted Experimental Station,
Harpenden, Herts.

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CONTEMPORARY AGRICULTURAL LAW.

(*Note.*—This article covers a period of twelve months to the rising of Parliament and of the Courts for the Summer Vacation, 1936.)

In 1935 my late partner Mr. Alfred Ellis expressed his sorrow that the request to write had been occasioned by the death of Mr. Aubrey J. Spencer. It is, I think, tragic that within twelve months it should fall to me to express the same feelings of sorrow on the passing of the man to whom I was articled and who was my friend as well as partner.

I.—LEGISLATION.

Several statutes of importance have been passed during the year under review. In particular the Tithe Act is of far-reaching importance to the people concerned.

THE CATTLE INDUSTRY (EMERGENCY PROVISIONS) ACT, 1936, extends until the 31st July, 1937, the period during which cattle or carcases of cattle must have been sold in order that payments in respect thereof may be made out of the Cattle Fund.

THE UNEMPLOYMENT INSURANCE (AGRICULTURE) ACT, 1936, brings agricultural labourers under the Unemployment Insurance Act, 1935. The new Act must be read with the Act of 1935. Employment in agriculture includes employment in horticulture and forestry.

The weekly contributions payable are as follow :—

Class of employed persons to whom rate applies.	Weekly rate of contribution.	
	By the employed person.	By the employer.
	d.	d.
Men who have attained the age of 21 years	4½	4½
Women who have attained the age of 21 years	4	4
Young men between the ages of 18 and 21 years	4	4
Young women between the ages of 18 and 21 years	3½	3½
Boys between the ages of 16 and 18 years	2	2
Girls between the ages of 16 and 18 years	1½	1½
Boys who have not attained the age of 16 years	1½	1½
Girls who have not attained the age of 16 years	1	1

In order to qualify for benefit a worker must fulfil four statutory conditions. These are :—

(1) Not less than twenty contributions must have been paid in respect of him as an agricultural contributor during

the two years immediately preceding the date on which the claim is made. (An allowance of time will be made for sickness.)

(2) Application for benefit must have been made in the prescribed manner and since the date of the application he must have been continuously unemployed.

(3) He must prove that he is capable of, and available for, work.

(4) If he has been required to attend an authorized course of instruction he must prove either that he has attended or that he had good cause for not attending.

There are various causes of disqualification. A worker will be disqualified—

(1) If he has lost employment by reason of a stoppage of work which was due to a trade dispute in which he was concerned. In this case, no benefit will be paid while the stoppage of work continues, unless in the meantime the worker has found other work.

(2) If he has lost employment voluntarily or by reason of misconduct. In this case no benefit will normally be paid during the first six weeks of unemployment.

(3) If he refuses or fails to apply for suitable work. Here the period of disqualification is also six weeks.

(4) If he is in prison or a workhouse.

(5) If he is for the time being in receipt of any sickness or disablement benefit under the National Health Insurance Acts, 1924 to 1932.

The periods over which payments extend are as follow :—

A worker will, if he fulfils the statutory conditions and is not disqualified, be entitled to receive in a benefit year benefit in respect of periods not exceeding in the aggregate—

(*a*) twelve days for the first ten contributions standing to his credit at the beginning of the benefit year, and

(*b*) three further days for every contribution in addition to the first ten; provided that benefit cannot be paid in respect of periods exceeding in the aggregate three hundred days in any benefit year.

The rates of benefit are as follow :—

Class of Agricultural Contributor.	*Rate of Benefit* s.	d.
Men who have attained the age of 21 years	14	0
Women who have attained the age of 21 years	12	6
Young men between the ages of 18 and 21 years	10	6
Young women between the ages of 18 and 21 years	9	6
Boys between the ages of 17 and 18 years	6	0
Girls between the ages of 17 and 18 years	5	0
Boys who have not attained the age of 17 years	4	0
Girls who have not attained the age of 17 years	3	6

Additonal benefit is payable in cases where the contributor has persons dependent upon him.

No agricultural benefit can be applied for before the 29th October, 1936, or received in respect of agricultural contributions in respect of any day before the 5th November, 1936.

Repayments.—By Section 10 of the Act (implemented by an order entitled "Long Hirings in Agriculture Provisional Regulations 1936, S. R. & O. 1936, No. 388") provision is made for the repayment to the employer and the employed person of the appropriate proportion (defined below) of the agricultural contributions paid.

Repayment can be claimed, however, only where a contract is made for the employment of a person in agriculture for a period of yearly or half-yearly hiring. The parties must prove the contract when it is made, and again prove that it has been complied with at the expiration of the period of hiring. The necessary forms can be obtained at local Labour Exchanges.

For this purpose "period of yearly hiring" means a period of not less than fifty consecutive weeks. "Period of half-yearly hiring" means a period of less than fifty but not less than twenty-one consecutive weeks. "Appropriate proportion" means, in the case of a period of yearly hiring, 25 per cent., and in the case of a period of half-yearly hiring, 12½ per cent.

It does not seem that the contract need necessarily be in writing, but in practice difficult questions are likely to arise as to the terms that may be included without jeopardizing a claim to repayment. It seems clear that a term providing that the employer may terminate the employment if the employee becomes physically incapable will not prevent a successful claim being made, since such a term would in any event be implied by law. But what will be the effect of a term giving the employer (or the employee) the right to determine the contract without any reason stated? On page 4 of their Report on the Draft Regulations made under the Act, the Unemployment Insurance Statutory Committee say: "We are advised that a long hiring contract which contains a provision empowering either party by notice to terminate the contract during its currency is not such a contract for a period of yearly or half-yearly hiring as is contemplated by Section 10 of the Act."

This is perhaps hardly the place for a legal argument, but the point is one of importance to farmers, since if the Committee are right, a choice must be made between forgoing a claim to repayment and assuming the perhaps intolerable burden of an unbreakable contract. For this reason, I think I am justified in mentioning that the Committee's view is contrary to that of certain eminent members of my profession, who are of the opinion that a contract containing a power to determine is a contract within the meaning of Section 10 of the Act. Support for this view may be derived from the decisions in *Rex* v. *Byker* (*Inhabitants*) (1823) 2 B. & C. 114 and *Rex* v. *Sandhurst* (*Inhabitants*) (1827) 7 B. & C. 557, in which cases it was held that a contract remains a hiring for a year, even though it is subject to a provision giving either party the right to determine it at the end of a less period than a year. Further, an analogous position arises in the interpretation of Section 4 of the Statute of Frauds, which section lays it down that a contract not to be performed within one year cannot be enforced unless it is in writing. It is now settled law that a contract for a term exceeding a year, but subject to determination by notice by either party within a year, is a contract not to be performed within a year within the meaning of the Statute. Authorities are *Dobson* v. *Collis* (1856) 1 H. & N. 81, *Birch* v. *Liverpool* (*Earl*) (1829) 9 B. & C. 392 and *Hanau* v. *Ehrlich* (1912, A.C. 39).

THE TITHE ACT, 1936, which is of great importance to landowners, has two main objects.

The first is to extinguish tithe rent-charge from the 2nd October, 1936. After that date annuities called "Redemption Annuities" will be payable for sixty years. These annuities will be in the proportion of £91 11*s.* 2*d.* per £100 of tithe rent-charge if any of the land was agricultural land on the 1st April, 1936, but in any other case they will be in the proportion of £105 per £100. Five-sixths of the annuity paid will be allowed off the annual value of the land for the purposes of Schedule A assessment.

The second object is to make the owner of land, which was formerly subject to tithe rent-charge, personally liable for payment.

Executive Authority.—Executive powers are vested in the "Tithe Redemption Committee," who will work the Act, and (until the 2nd April, 1943, at least) collect the annuities.

The Commissioners are empowered to establish district registers and to prepare maps which will show (1) land subject to an annuity and the amount thereof, and (2) who are the actual owners of such land. It will of course be necessary for them to determine whether or not land was agricultural on the 1st April, 1936, and it will also be necessary for changes to be made in the register and the maps whenever a piece of land is sold. For this reason a vendor must within one month of the sale furnish on the prescribed form particulars of the new owner.

Any person authorized in writing by the commissioners will have the right, upon production of his authority, to enter and inspect any land for the purpose of obtaining information required by the Commissioners for the discharge of their functions.

Any proceedings which may be necessary will take place before the Commissioners, and to such proceedings certain of the provisions of the Arbitration Acts will apply. Any person who is interested in the land in question must be given an opportunity of making representations and, if desired, the Commissioners must state a Special Case for the opinion of the Court on any point of law. In other respects their decision is conclusive and binding.

Transitional Provisions and Arrears.—The tithe rent-charge payable on the 1st October, 1936, is to be computed at the rate of £91 11*s.* 2*d.* instead of £105 per £100, if any of the land in respect of which it was paid was agricultural land on the 1st April, 1936, and it is to be paid to the pre-existing tithe-owner.

Arrears of tithe due on the 2nd October, 1936, are not extinguished by the Act, but if they are still outstanding on the 1st April, 1937, they must be paid to the Commissioners instead of to the tithe-owner. The Commissioners cannot commence proceedings for their recovery, however, until one month after the tithe-owner has given written notice both to them and to the tithe-payer. At any time within that month the tithe-payer may give the Commissioners written notice that he desires the question of the recovery of the arrears to be referred to the "Arrears Investigation Committee." If satisfied that the tithe-payer's circumstances make it fair and reasonable to do so, that Committee may remit all or part of the arrears or order payment by instalments. If, on the other hand, they think that the application is frivolous, they may order the tithe-payer to pay the costs. While the matter is in the hands of the Committee no legal proceedings may be commenced or continued against the tithe-payer. It should be especially noticed that if there is any doubt as to the tithe-payer's liability, he should not give notice to refer the matter to the Committee, for this amounts to an admission of liability.

Proceedings for the recovery of arrears of tithe rent-charge cannot be commenced after the expiration of two years from the date on which the payment first became due. The method of recovering the arrears of tithe rent-charge is the same as that for the recovery of annuities, that is to say they become a personal debt due from the tithe-payer.

Who is the Owner of Land?—Especial attention is given to this question since the annuities are a personal debt from the landowner. The "Owner of land" is defined by Section 17 of the Act as—

(*a*) the freeholder, unless the land is subject to a lease granted for more than fourteen years at a rent less than the rack rent; or (*b*) the leaseholder, if he holds under such a lease as is mentioned in (*a*) above.

A rack rent is defined as a rent of not less than two-thirds of the full net annual value of the property. This value is taken to be the rent at which the property might reasonably be expected to let from year to year free from all usual tenant's rates and taxes, and deducting therefrom the probable average annual cost of repairs, insurance and other expenses (if any) necessary to maintain the property in a state to command such rent.

Machinery is provided for the ascertainment of the owner. The Commissioners may serve upon the person who appears to them to be the owner of any land notice in writing that they propose to enter his name in the annuities register as the owner. Then, within three months, he may notify the Commissioners that he denies ownership, whereupon the Commissioners may make application to the High Court or a County Court for a declaration of ownership. If no notice is given by the presumed owner, or if the Court decides that he is the owner, he becomes personally liable for the annuity, and remains so until written notice of change of ownership is given to the Commissioners.

What is Agricultural Land?—Agricultural land is "any land used as arable, meadow or pasture ground only, land used for a plantation or a wood or for the growth of saleable underwood, land exceeding one-quarter of an acre used for the purpose of poultry farming, cottage gardens exceeding one-quarter of an acre, market gardens, nursery grounds, orchards or allotments, including allotment gardens within the meaning of the Allotments Act, 1922 (that is, allotments not exceeding 40 poles in extent which are wholly or mainly cultivated by the occupier for the production of vegetable or fruit crops for consumption by the allotment holder or his family), but does not include land occupied together with a house as a park, gardens (other than as aforesaid), pleasure grounds, or land kept or preserved mainly or exclusively for purposes of sport or recreation, or land used as a racecourse; and for the purpose of this definition the expression 'cottage garden' means a garden attached to a house occupied as a dwelling by a person of the labouring classes."

"Agricultural land" also includes buildings (including dwelling-houses) occupied together with such land and used primarily in connection with agricultural operations thereon.

Apportionment.—In cases where an annuity is charged upon land which is in the ownership of different persons, the Commissioners must apportion the annuity between those persons. In doing so, they must have regard—

(*a*) to any informal arrangement for apportionment which was made before the 2nd October, 1936;

(*b*) to any agreement which may be arrived at between the owners and notified to the Commissioners;

(*c*) to the annual value of the land or any part thereof as ascertained for the purposes of income tax under Schedule B, and

(*d*) to the areas of the several parts of the land which are in different ownership.

Extinction.—In the following circumstances the Commissioners may extinguish an annuity or part thereof :—

(1) Where the annuity is charged in respect of land in the ownership of numerous owners and the cost of apportionment would be excessive in relation to its amount.

(2) Where the cost of collection and management of the annuity would be excessive in relation to its amount.

(3) Where an annuity is charged upon land part of which is washed away by the sea, the annuity may be reduced by such amount as seems to the Commissioners just.

Redemption.—Redemption may be compulsory or voluntary.

(*a*) *Compulsory.* In the following cases, annuities will be compulsorily redeemed :—

(1) Where an annuity of £1 or less, or several annuities amounting in the aggregate to £1 or less, is or are charged upon land in the ownership of a single person who does not own any other land in the district upon which an annuity is charged.

(2) Where an annuity is charged in respect of land the whole of which is divided for building or other purposes into numerous plots, or is about to be so divided.

The redemption money may be made payable in instalments.

(*b*) *Voluntary.* A landowner is entitled, on making application to the Commissioners, to be notified of the amount required for the redemption of an annuity. On payment of that amount the annuity will be extinguished. The capital value may also be reduced at any time by payments of not less than £25. The amount of the consideration money to be paid for the redemption of an annuity, and the procedure for redemption, will be such as may be prescribed by rules to be made by the Treasury.

Remission.—Where one or more annuities, which are charged in respect of land wholly comprised in an agricultural holding, exceed one-third of the annual value of that part of the holding in respect of which they are charged, one-half of the excess will be remitted. "Annual value" here means annual value for income tax purposes under Schedule B.

In cases where an annuity is charged in respect of land part only of which is an agricultural holding, the owner may have it apportioned by the Commissioners so that he may take advantage of these provisions.

In order to obtain a remission, the tithe-payer must, before the 1st March in each year, apply on the prescribed form to the Surveyor of Taxes for the appropriate parish, when a certificate will be issued showing the annual value for the year ending on the 5th April in that year. If the land charged forms part only of the land comprised in the Schedule B assessment, the surveyor will apportion the assessment and issue a statement showing the apportionment. If the land charged is not assessed for Schedule B the Surveyor will issue a statement showing what the assessment would be. If either the Commissioners or the owner is dissatisfied with the statement, an appeal may be made within one month to the General Commissioners for Income Tax for the district.

Recovery of Annuities and Redemption Moneys.—Annuities and redemption moneys are debts due to His Majesty from the person who is the owner of any land in respect of which the annuity is charged, and they may be recovered in the same way as ordinary debts. In addition, the collector of taxes may distrain on all the goods and chattels of the owner. It appears that, unlike tithe rent-charge, an annuity never becomes statute-barred. A trustee tithe-payer may be released if he shows that the assets of which he is trustee are insufficient to pay the debt.

The Tithe-Owner is to be compensated by the issue to him of stock, called "redemption stock," charged by way of guarantee on the Consolidated Fund. The amount of stock to be issued in compensation, in respect of a rent-charge, shall be such an amount as will yield interest equal to the gross annual value of the rent-charge. Certain deductions are to be made, however, in respect of the cost of collection and management, land tax, and so on.

The gross annual value of a rent-charge is to be taken to be the amount which bears to the amount of the rent-charge the same proportion as the following sum bears to the sum of £100, that is to say:

(*a*) if any of the land was agricultural land on the 1st April, 1936, £91 11*s.* 2*d.*

(*b*) if none of the land was agricultural land on the 1st April, 1936—

  (i) in the case of a lay tithe rent-charge, £105; or

  (ii) in the case of an ecclesiastical tithe rent-charge, £91 11*s.* 2*d.*

II.—CASES IN THE COURTS.

1. *Landlord and Tenant.*—An interesting decision is that in *Earl Temple* v. *Baber and Tibbotts.* A field was described in a tenancy agreement of 1904 as arable, and it was arable at that time. Since 1914, or earlier, it has been pasture, and in the

Bath County Court, His Honour Judge Kirkhouse Jenkins held that it should be treated as temporary pasture and that the tenants were entitled to compensation. A full report of this case will be found in the *Estates Gazette* of 8th August, 1936.

2. *Rates and Taxes.—Watkins* v. *Herefordshire Assessment Committee* (52 T.L.R. 148). Mr. Watkins is the owner and occupier of The Grove Farm. Through the farm runs a river, the water of which is used for watering stock and washing sheep. The river bed is composed of shingle and gravel and this is dredged out, in summer, when it is needed for repairs to roads or farm buildings. By a verbal agreement the fishing rights are let to Mr. Moxon at an annual rent of £14.

The rating authorities attempted to insert in the valuation list a hereditament described as "Land covered with water with fishing rights." The Divisional Court, however, held that the bed of the river was agricultural land within the meaning of Section 2 (2) of the Rating and Valuation (Apportionment) Act, 1928, and was not liable to be rated. Accordingly Mr. Watkins was not rateable in respect of receipts from his letting of the fishing rights.

Peterborough Royal Foxhound Show Society v. *Commissioners of Inland Revenue* (1936, W.N. 11; 52 T.L.R. 391). Section 23 of the Finance Act, 1924, exempts from income tax the profits or gains arising to an Agricultural Society from an exhibition or show held for the purposes of the Society if they are applied solely to the purposes of the Society.

A Society to promote the interests of foxhound breeding is therefore entitled to claim exemption from tax in respect of profits arising from its annual show, provided that such profits are used to further the Society's ends. It is not, however, a charity, since it benefits foxhunting and not the community, and so income tax must be paid on income arising from investments.

3. *Marketing Schemes.—Potato Marketing Board* v. *Harlow.* (All England Law Reports. 1936, Volume I, 489.)

Paragraph 82 of the Potato Marketing Scheme, 1933, provides that: "The Board may by resolution require every registered producer to contribute to the Fund from time to time such sums as the Board shall determine but not exceeding in any one year ten shillings per acre of his potato acreage, provided that . . . if in any year the potato acreage of a registered producer exceeds his basic potato acreage . . . and if, in the opinion of the Board, the expenditure of the Board in the operation of this Scheme is or is likely to be increased by reason of such excess acreage, the Board may require the registered producer to pay the Board in respect of each acre of his excess acreage, such further sum (not exceeding five pounds per acre) as, in the opinion of the Board, the registered producer ought to contribute towards defraying such increased expenditure. . . . Any sum required by the Board to be paid by a registered producer under this paragraph shall be recoverable as a debt due to the Board."

On 10th April, 1934, the Board passed the following resolution: "Whereas in the opinion of the Board the expenditure of the Board in the operation of the Scheme is likely to be increased if in the year ending on the 31st December, 1934, the potato acreage of any registered producer exceeds his basic potato acreage, and whereas in the opinion of the Board each registered producer ought to contribute the sum of five pounds per acre in respect of each acre of his excess acreage towards defraying such increased expenditure, now therefore, by virtue of the powers in this behalf contained in paragraph 82 of the Scheme, the Board hereby require every registered producer to pay to the Board, on or before the 1st August, 1934, the sum of five pounds per acre in respect of each acre by which his potato acreage for the year 1934 exceeds his basic potato acreage."

The defendant was a registered producer who had an excess acreage of 10 acres, and, on his refusal to pay, the Board claimed the sum of £50 from him. It was argued on his behalf that the resolution was not a proper exercise of the Board's powers in that it referred to registered producers collectively and not individually. Horridge J. held, however, that the Board had dealt with each registered producer and not with them as a group, and accordingly the resolution operated to impose an excess levy on any registered producer who exceeded his basic acreage. The question as to whether or not additional expenditure was likely to be incurred by the Board as a result of the defendant's excess acreage was a matter for the decision of the Board. The Board formed a *bona fide* opinion and the Court would not go into the facts on which such opinion was based. Judgment was accordingly given for the plaintiffs.

4. *Cases concerning Animals.—Deed* v. *Davies.* (1935, 2 K.B. 282. Court of Appeal.)

The owner of an animal, depastured on land adjoining a highway, is under no duty to prevent it from straying on the highway, unless he knows that it is vicious. If, on the other hand, a person takes an animal on to the highway, he must exercise reasonable care to prevent it from doing damage to other persons. The same duty exists if an animal is left in the street, or in a stable or yard adjoining the street, if proper steps to prevent it straying are not taken. Whether reasonable care has been taken is a question of fact in each case and Romer L.J. in his judgment said "Reasonable care in the country may not be reasonable care in the town: reasonable care in the case of one animal may not be reasonable care in the case of another."

Cotterill v. *Penn* (1936, 1 K.B. 53). By Section 23 of the Larceny Act, 1861, it is provided that " Whosoever shall unlawfully and wilfully kill, wound, or take any house dove or pigeon under such circumstances as shall not amount to larceny at common law " is guilty of an offence. It is no defence for a defendant to plead either (1) that he killed the pigeon in the honest belief that it was a wild pigeon which he might lawfully kill or (2) that he killed it because he feared that it might damage his crops.

5. *Labour.*—*Gutsell* v. *Reeve* (1936, 1 K.B. 272 ; 1935, W.N. 178 ; 52 T.L.R. 55). The defendant employed the plaintiff as an agricultural labourer from June 1925 to May, 1927, at a wage of £1 2*s*. 0*d*.—which was subsequently raised to £1 3*s*. 0*d*.— per week. These wages were lower than the minimum prescribed for farm workers in Sussex under the Agricultural Wages (Regulation) Act, 1924. In June 1935 (that is, more than six years after he had left the defendant's employ) the plaintiff brought an action claiming £39 8*s*. 6*d*., being the difference between the amount he had actually received and the amount of the minimum wages to which he was entitled.

The Court of Appeal held that the action was not an action for debt upon a statute, since the only effect of the statute was to substitute in the service agreement the proper rate of wages for the agreed rate. The claim was therefore for a simple contract debt, and was barred by the Statute of Limitation.

G. G. FAIRBAIRN.

Ellis & Fairbairn,
22, Bedford Row,
London, W.C.1.

AGRICULTURAL STATISTICS, 1936.

The following table gives a summary of the acreages of crops and grass, and the numbers of live stock returned by occupiers on June 4th, 1936, together with the corresponding figures for 1935. The figures for 1936 are subject to revision.

Acreage under Crops and Grass and Numbers of Live Stock *on holdings above one acre in extent in England and Wales as returned by occupiers on June 4th,* 1936, *and June 4th,* 1935.

Distribution.	1936. Acres.	1935. Acres.	Increase (+) or decrease (−) Acres.
Total Acreage under all Crops and Grass	24,858,000	24,956,800	− 98,800
Rough Grazings [1]	5,442,000	5,419,900	+ 22,100
Arable Land	9,113,000	9,397,900	− 284,900
Permanent Grass for Hay	4,661,000	4,642,700	+ 18,300
" " not for Hay	11,084,000	10,916,200	+ 167,800
Wheat	1,703,000	1,772,300	− 69,300
Barley	819,000	791,700	+ 27,300
Oats	1,417,000	1,418,600	− 1,600
Mixed Corn	97,800	93,900	+ 3,900
Rye	19,300	20,500	− 1,200
Beans for stock feeding or seed	121,300	133,300	− 12,000
Beans for market or canning	15,200	20,700	− 5,500
Peas for stock feeding or for seed	46,300	42,400	+ 3,900
Peas for canning or packeting, green or dried	28,500	26,900	+ 1,600
Green Peas for market	67,700	63,600	+ 4,100
Potatoes, first earlies	56,400	55,100	+ 1,300
Potatoes, main crop, including second earlies	399,400	407,700	− 8,300
Turnips for stock feeding or seed	177,200	199,100	− 21,900
Swedes for stock feeding or seed	253,900	277,400	− 23,500
Turnips and Swedes for human consumption	17,600	21,100	− 3,500
Mangolds	245,800	251,000	− 5,200
Sugar Beet	356,800	367,300	− 10,500
Kohl Rabi	5,400	5,600	− 200
Rape (or Cole)	51,800	51,500	+ 300
Cabbage and Savoys for fodder	16,900	24,600	− 7,700
Kale for fodder	100,700	88,000	+ 12,700
Cabbage, Savoys, Green Kale and Sprouting Broccoli for human consumption	43,500	37,500	+ 6,000
Brussels Sprouts	35,000	34,100	+ 900
Cauliflower or Broccoli (non-sprouting)	20,500	19,500	+ 1,000
Carrots	16,900	15,800	+ 1,100
Vetches or Tares	62,200	53,800	+ 8,400
Lucerne	38,100	36,000	+ 2,100
Hops	18,300	18,300	—
Small Fruit	59,900	59,500	+ 400
Orchards	257,700	262,400	− 4,700
Clover and Rotation Grasses for Hay	1,338,500	1,388,600	− 50,100
" " " not for Hay	760,500	945,400	− 184,900
Bare Fallow	334,000	287,700	+ 46,300
	No.	No.	No.
Horses used for Agricultural purposes (including Mares for breeding)	560,700	586,400	− 25,700
Unbroken Horses (including Stallions) One year and above	95,800	93,700	+ 2,100
Under one year	50,600	47,000	+ 3,600
Other Horses	157,500	146,700	+ 10,800
TOTAL OF HORSES	864,600	873,800	− 9,200

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[1] Mountain, Heath, Moor, Down and other rough land used for grazing.

Distribution.		1936. No.	1935. No.	Increase (+) or decrease (—) No.
Cows and Heifers in milk		2,225,200	2,232,100	− 6,900
Cows in Calf but not in Milk		404,900	382,200	+ 22,700
Heifers in Calf		442,800	436,800	+ 6,000
Other Cattle	Under one year	1,214,900	1,126,800	+ 88,100
	One year and under two	1,250,000	1,353,800	− 103,800
	Two years and above	996,100	1,009,300	− 13,200
TOTAL OF CATTLE		6,533,900	6,541,000	− 7,100
Ewes kept for breeding		7,226,800	7,124,800	+ 102,000
Other Sheep	One year and above	1,679,300	1,756,700	− 77,400
	Over six months and under one year	437,300	439,600	− 2,300
	Under six months	7,287,100	7,155,900	+ 131,200
TOTAL OF SHEEP		16,630,500	16,477,000	+ 153,500
Sows kept for breeding		483,100	494,100	− 11,000
Other Pigs	Over two months	2,218,900	2,114,300	+ 104,600
	Under two months	1,099,100	1,205,000	− 105,900
TOTAL OF PIGS		3,801,100	3,813,400	− 12,300
Fowls	Over 6 months old	25,267,000	26,633,000	−1,366,000
	Under 6 months old	32,139,000	31,657,000	+ 482,000
TOTAL OF FOWLS		57,406,000	58,290,000	− 884,000
Ducks		2,588,000	2,487,000	+ 101,000
Geese		630,000	646,000	− 16,000
Turkeys		734,000	684,000	+ 50,000

This year's returns show an increase of 22,100 acres in rough grazings, the increase resuming the general trend that was interrupted by a small decline between 1934 and 1935. Nor has the arrest in the decline of the total arable acreage, which was a feature of last year's returns, been maintained, for there is a general 3 per cent. decrease (9,113,000 acres in 1936 against 9,397,900 acres in 1935). This decline is mainly due to a 10·1 per cent. decrease in the area under clover and rotation grasses, although other decreases contribute. Bare fallow shows a 16·1 per cent. increase upon last year's figure. Permanent grass, too, which in 1934 showed a decline for the first time since 1916, and which also showed a decline last year, has increased by 186,100 acres, or 1·2 per cent. on the 1935 returns.

The 1931 acreage of wheat, at 1,197,000 acres, was the lowest on record, but subsequent years have seen steady increases. However this year, owing, in all probability, to the unfavourable seed-time, the area has again fallen by 3·9 per cent. and stands at a total of 1,703,000 acres. Barley shows an increase of 27,300 acres over last year's acreage.

All root acreages show declines. The total area under potatoes still continues to fall. The area recorded in 1936, at 456,000 acres, was the lowest since 1931, but the loss was borne by main crop and second earlies, the area devoted to first earlies having increased by 1,300 acres. Roots for fodder and for human consumption all show smaller totals, and last year's decline in the sugar-beet area has been followed by a further but smaller decline of 10,500 acres (2·9 per cent.) in 1936. The total acreage under sugar beet is now slightly below that recorded for 1933.

The growth of fodder kale is gradually increasing, the area returned this year being 100,700 acres, or 12,700 acres more than that of 1935. Vegetables for human consumption continue steadily to increase in acreage, as also do the areas planted to small fruit.

So far as live stock is concerned, the figures reflect past tendencies : dairy stock has seen an 0·7 per cent. increase, but other cattle have diminished by some 29,000 head (0·8 per cent.), the most pronounced decrease being that of cattle between one and two years old. However, there is an increase of 88,100 in cattle under one year, which seems to indicate a slight return of confidence on the part of the breeder. Taken on the whole, the numbers of cattle have suffered a further reduction.

Sheep are the only class of live stock that show total increases, the number returned being 153,500 (0·9 per cent.) greater than that for 1935 ; of this total, ewes kept for breeding, and lambs under six months old, show increases that more than offset the decline in numbers of other sheep.

Pigs and horses show declines of 0·3 per cent. and 1·1 per cent. respectively, the declines for both classes of stock applying to breeding animals and, in the case of pigs, also to those under two months old.

BRISTOL SHOW, 1936.

AFTER the conclusion of somewhat protracted negotiations with the Bristol Corporation and the decision of the Bath and West and Southern Counties Society not to hold their 1936 Show at Trowbridge, it appeared that the prospects of a most successful Royal Show at Bristol were bright indeed. Unusual difficulties connected with the site and the approach to the Showyard had been solved to the satisfaction of all concerned.

Notwithstanding the adverse weather conditions, all will agree that the exhibition staged in Ashton Park was one of the best ever held.

Four times has the national agricultural gathering taken place in the West Country capital, the previous occasion being

23 years ago. Some figures concerning these visits of the Society are given below :—

Year.	President.	Implement, etc., Stands.	Entries of Live Stock.	Persons paying for Admission.	Financial Result. + = Profit — = Loss
					£
1842	Mr. Henry Handley, M.P.	99	510	No record.	— 1,806
1878	Col. Kingscote, C.B., M.P.	435	1,354	122,042	+ 1,667
1913	Earl of Northbrook	513	2,852	179,148	+ 3,115
1936	Sir Merrik R. Burrell, Bt., C.B.E.	377	3,198	72,806	— 1,667

Nearly 100 acres in extent, the Showyard kindly placed at the Society's disposal by the Hon. Mrs. Esmé Smyth, of Ashton Court, was situated in one of the most beautiful parks in England. It was an almost level site, giving a view of the Mendip, Quantock and Cotswold Hills. The main entrance was on the Bristol-Portishead Road, about three miles from the centre of the City. For the convenience of visitors coming from the West, a second entrance was erected in Beggars Bush Lane. Extensive spaces adjoining the entrances were provided for the parking of cars and motor coaches, and at times both of these were filled.

Frequent services of buses from Bristol were provided as far as the Clifton Suspension Bridge, over which passengers had to walk, and a further fleet of buses took them on to the Showground.

It was realized that the Bridge would introduce a serious complication in the traffic arrangements. An agreement was therefore made with the authorities under which, for a financial consideration, the Bridge was completely freed of toll for the five days of the exhibition. This, it is believed, is the first time that passage has been free since the bridge was opened in 1864.

The erection of buildings on the Park was not a simple matter, for the site was of Limestone rock formation and practically all the post-holes had to be specially hand and machine drilled, with consequent additional expense.

Water supply, too, presented further problems, first of all in the work of laying the pipes, and later in securing the necessary pressure. For the last-named purpose pumping plant was installed on the ground by the Pulsometer Engineering Co., Ltd. The Bristol Waterworks Co. are deserving of all praise for the satisfactory manner in which they carried out the work and secured a constant supply for catering requirements, the wants of the live stock and fire protection services.

For a number of years past it has been the custom to provide some electrical power in the Showground, but at Bristol electricity was the only public utility service employed for lighting and heating, as well as power, and it was used with success by

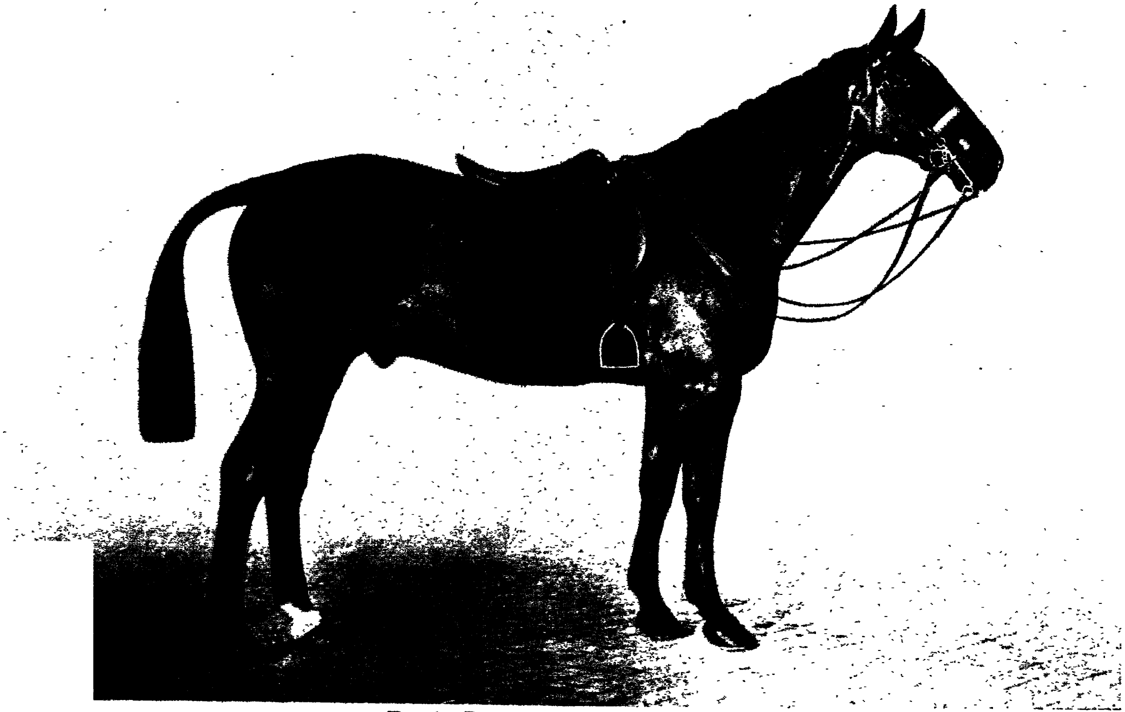


FIG. 1.—RIDING HUNTER, "MORTIMER."
Winner of Challenge Cup for best Riding Hunter.
Exhibited by MR. B. A. SELBY.

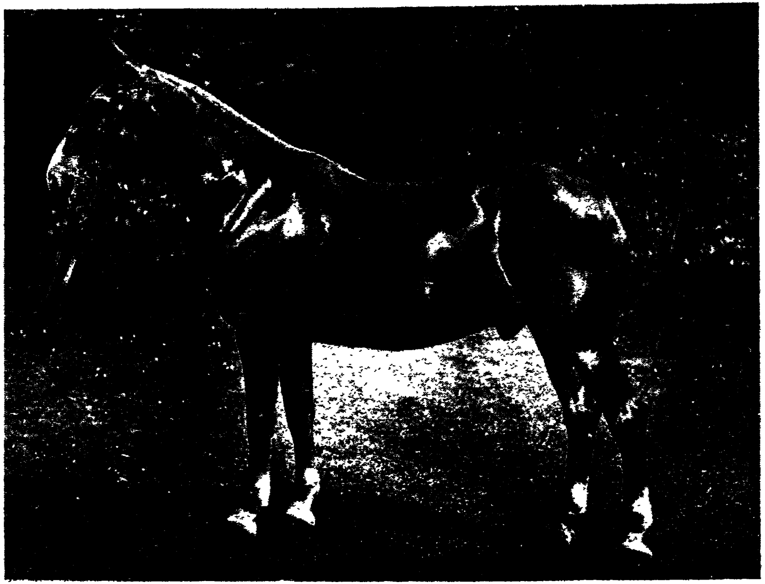


FIG. 2.—WEIGHT-CARRYING COB, "JORROCKS."
Winner of First Prize, Bristol, 1936.
Exhibited by SIR ARCHIBALD WEIGALL, K.C.M.G.

the Society's caterers for the whole of their cooking requirements, as well as for cold stores operated by refrigerators. As last year at Newcastle, all the steam, hot water and power used in the Working Dairy was generated by means of electricity, and the atmosphere in the Flower Show tents was kept fresh with the aid of electric fans.

The staff of the General Post Office, Bristol, are to be commended for their work during the Show. A completely equipped teleprinter office was installed on the ground. Direct teleprinter circuits functioned between the Show and the Central Telegraph Office, London, and Bristol, while teleprinter service was established as rendered necessary with many other centres. Some 2,600 ordinary telegrams were handed in for transmission, 1,300 were delivered by messengers on the ground, and 140,000 words of Press matter were sent to newspapers all over the country. There were 11 public telephones in the Showground, 30 direct exchange lines were provided for standholders' requirements, and the volume of telephone traffic before and during the Show handled by the Bristol exchange was extremely heavy.

Prizes of a total value of £16,190 were offered. This sum included £3,416 generously contributed by various Breed Societies and £1,985 from other sources. In the Horse section a popular innovation was a class for Weight-carrying Cobs. Dartmoor and Exmoor ponies were also provided with a classification. Two classes for Mounted Police horses were well filled and attracted entries from Birmingham, Bradford, Liverpool, Salford and Sheffield, as well as Bristol. The teams of horses of the heavy draught breeds, judged on the Wednesday, proved an attractive item in the Ring during the rest of the Show. Children's ponies had an entry of 42, and this year added interest was given to these classes by the award of a Cup presented by the Lord Mayor of London for the best exhibit.

Daily Jumping Competitions had large entries and were keenly contested, although it must be admitted that the going on some occasions was not of the best.

Headed by Dairy Shorthorns with an entry of 179, the Cattle section, with its great variety of breeds, made an impressive display. Classes for the Gloucestershire breed were a notable addition to the schedule. It is interesting to recall that a group of animals of this breed was exhibited "not for competition" at the Gloucester Show of 1909 from the Duke of Beaufort's estate at Badminton. Some notes on this old breed will be found in Vol. 70 of the *Journal*.

It is to be regretted that the classes for Welsh, Park, Galloway and Highland Cattle had to be cancelled owing to the entries of these breeds not reaching the minimum required by the Regulations.

Classes for cattle of dairy and beef type belonging to members of Young Farmers' Clubs in Western Counties had a large entry.

This year a special section was included in the prize-sheet for Milk-Recorded Cattle, restricted to the Counties in the vicinity of the Show. These animals were exhibited and judged on the Friday.

Goats had an entry of 68, the same as at Newcastle.

In the Sheep classes the entries were 592, against 684 at Newcastle. Two breeds—Exmoor Horn and Cheviot—were not seen at Bristol, as their classification had to be cancelled owing to shortage of entries.

Large Whites led the Pig section with 199 entries, out of a total of 669—76 more than last year's aggregate.

With larger entries of Cider and Cheese, the Produce showed a considerable increase on 1935.

Poultry were rather fewer, with 651 entries against 668 at Newcastle.

A Comparative Statement of Entries is given on page 397, together with a Table of Classes, Prizes and Entries at the Bristol Shows of 1913 and 1936.

As usual, a complete list of the Awards will be found in the Appendix to this volume.

Such was the condition of the ground on days immediately preceding the Show Week that a message was sent to the Bristol City Services Department, asking for a water-cart to lay the dust! It was soon provided, but unfortunately it was not needed. About 3 p.m. on the Monday a violent storm, with hail, thunder and lightning, burst over Bristol, and it was stated that 2 inches of rain fell in three-quarters-of-an-hour. Landslides occurred in Avon Gorge, streets were transformed into rivers, business premises and private houses were flooded. Although the rainfall at Ashton Park was heavy, the Showground did not feel the storm in its full severity, and the ground being some 400 feet above sea-level, the water got away quickly. Further rain fell during the night, but the Show opened on the Tuesday morning under sunny conditions; the ground had not suffered unduly from the downpour.

It was therefore most unfortunate that a certain London Daily appeared on Wednesday with the headlines, "Royal Show Flooded. 100 acres ankle deep in Mud." This kind of statement, following the widespread notices in the general Press of a "Cloudburst over Bristol," must have caused many potential visitors at a distance to give up all thought of making the journey to this year's Show.

Showers occurred on Tuesday, but the judging of the breeding classes of live stock, proceeding as usual, was completed in good time and with little interference.

COMPARATIVE STATEMENT OF ENTRIES, ETC.,

At two Shows held at Bristol in 1913 *and* 1916.

HORSES, CATTLE, AND GOATS.	1913.		1936.	
	Classes	Entries	Classes	Entries
HORSES :—				
Prizes		£3,591		£3,909
Shire	10	93	11	63
Clydesdale	8	40	7	30
Suffolk	8	33	13	97
Percheron	—	—	9	46
Hunter	14	96	10	83
Polo Pony	5	43	5	35
Cleveland Bay or Coach Horse	2	8	—	—
Hackney	9	49	—	—
Hackney Pony	4	14	—	—
Arab	—	—	3	12
Welsh Pony	5	22	2	9
Shetland Pony	2	9	2	16
Dartmoor Pony	—	—	4	28
Exmoor Pony	—	—	4	12
Riding Classes—				
Hunters	11	125	7	107
Cobs	—	—	1	11
Hacks	—	—	2	13
Children's Ponies	—	—	3	42
Driving Classes	13	159	10	46
Mounted Police	—	—	2	20
Jumping	4	74	5	199
Total for HORSES	95	765	100	869[1]
CATTLE :—				
Prizes		£2,855		£6,867
Shorthorn	13	272	11	81
Hereford	8	89	9	70
Devon	7	62	8	48
Sussex	6	21	5	16
Welsh	6	33	5	—[3]
Park	—	—	3	—[3]
Gloucestershire	—	—	3	17
Longhorn	4	29	4	18
Aberdeen-Angus	6	50	6	74
Belted Galloway	—	—	4	17
Galloway	5	24	4	—[3]
Highland	2	3	3	—[3]
Dairy Shorthorn	5	63	11	179
Lincolnshire Red Shorthorn	8	44	7	42
South Devon	5	32	5	25
Red Poll	5	51	8	125
Blue Albion	—	—	5	19
British Friesian	5	41	13	119
Ayrshire	3	14	7	67
Guernsey	6	72	7	124
Jersey	8	171	7	149
Kerry	4	25	4	19
Dexter	4	45	5	43
Dairy Cows	2	13	—	—
Milk Yield	12	117	11	103
Butter Test	2	66	2	71
Total for CATTLE	126	1,337[1]	157	1,426[1]
GOATS :—				
Prizes				£120
Inspection Classes	—	—	10	68
Milk Yield	—	—	2	66
Total for GOATS	—	—	12	134[1]

SHEEP, PIGS, POULTRY AND PRODUCE.	1913.		1936.	
	Classes	Entries	Classes	Entries
SHEEP :—				
Prizes		£1,836		£2,252
Oxford Down	5	51	5	33
Shropshire	6	75	5	31
Southdown	6	66	7	94
Hampshire Down	8	94	5	38
Suffolk	6	20	6	56
Dorset Down	3	15	4	19
Dorset Horn	4	27	3	18
Wiltshire Horn	—	—	3	14
Ryeland	4	16	4	20
Kerry Hill (Wales)	2	8	5	40
Clun Forest	—	—	5	29
Lincoln	7	67	4	23
Leicester	4	20	4	18
Border Leicester	3	30	4	23
Wensleydale	4	17	5	16
Kent or Romney Marsh	6	87	6	45
Cotswold	4	24	—	—
Devon Long Wool	3	10	3	9
Devon Close Wool	—	—	3	12
Lonk	2	6	—	—
South Devon	5	23	4	12
Dartmoor	3	17	4	22
Derbyshire Gritstone	2	6	—	—
Herdwick	2	7	—	—
Exmoor Horn	3	8	3	—[3]
Black-faced Mountain	2	12	—	—
Cheviot	3	12	2	—[3]
Welsh Mountain	2	18	2	12
Black Welsh Mountain	—	—	2	8
Total for SHEEP	99	736	98	592
PIGS :—				
Prizes		£763		£1,685
Large White	8	135	8	199
Middle White	6	62	8	52
Tamworth	6	38	6	25
Berkshire	6	60	8	51
Wessex Saddleback	—	—	6	64
Large Black	6	61	8	104
Gloucestershire Old Spots	—	—	6	26
Lincolnshire Curly Coated	6	38	—	—
Cumberland	—	—	4	12
Essex	—	—	7	80
Long White Lop-Eared	—	—	5	29
Welsh	—	—	5	27
Total for PIGS	38	394	71	669
POULTRY :—				
Prizes		£432		£411
Entries	140	1,436	122	651
PRODUCE :—				
Prizes		£316		£354
Entries	62	685	49	426

Grand Totals for LIVE STOCK, POULTRY, PRODUCE, &c., in 1936 } 609 Classes . 4,767 Entries . £16,190 Prizes[2].

[1] Animals exhibited in more than one class are here counted as separate entries.

[2] Including £405 for Flower Show, £78 for Butter-Making Competitions, and £109 for Local Classes.

[3] Classes cancelled under regulation of Prize Sheet.

STATEMENT OF ENTRIES FOR THE 1936 SHOW, COMPARED WITH PREVIOUS YEARS.

Entries of Live Stock, Poultry and Produce.

	Bristol, 1936.	Newcastle, 1935.	Ipswich, 1934.	Derby, 1933.	Southampton, 1932.	Warwick, 1931.	Manchester, 1930.	Harrogate, 1929.	Bristol, 1913.
Horses .	*617	*644	*729	*592	*437	*568	*512	*634	*584
Cattle .	*1,252	*1,060	*1,281	*1,149	*1,009	*1,168	*1,164	*1,263	*1,188
Goats .	*68	*68	*107	*97	*75	*68	*48	*92	—
Sheep .	592	684	567	573	520	569	735	723	736
Pigs. .	669	593	841	688	551	688	678	691	394
Total .	3,198	3,049	3,534	3,099	2,592	3,061	3,137	3,403	2,852
Poultry .	651	668	792	984	840	741	901	943	1,436
Produce .	426	332	269	264	274	253	506	363	685

* Exclusive of Double Entries.

Shedding in Implement Yard (in Feet).

Description of Shedding.	Bristol, 1936.	Newcastle, 1935.	Ipswich, 1934.	Derby, 1933.	Southampton, 1932.	Warwick, 1931.	Manchester, 1930.	Harrogate, 1929.	Bristol, 1913.
	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.	Feet.
Ordinary .	1,765	1,760	2,240	2,095	1,845	2,190	2,690	2,995	6,870
Machinery	3,850	3,880	3,530	2,935	2,630	3,690	4,515	4,170	3,665
Special . (Seeds, Fertilizers, etc.)	3,163	3,071	3,176	3,360	2,450	3,083	3,488	3,686	3,689
Total . (Exclusive of Open Ground Space.)	8,778	8,711	8,946	8,390	6,925	8,963	10,693	10,851	14,224
No. of Stands	377	356	387	349	311	388	443	431	513

On Wednesday the Show again opened in fine weather, but showery conditions set in about eleven o'clock. Their Royal Highnesses the Duke and Duchess of York, who had passed the night at Badminton Court, arrived at the Show at noon, when a rainstorm was at its height. The cars were stopped inside the entrance, where a guard of honour composed of members of local branches of the British Legion was drawn up. Those in charge were presented to Their Royal Highnesses and received their thanks. The procession of cars headed by the Honorary Director of the Show (Mr. Burke) then continued through the Implement section to the Royal Pavilion, where the President (Sir Merrik Burrell), supported by Members of Council and the Local Committee, were waiting to receive the Royal visitors. The Duke and Duchess first drove to the Flower Show, where more than

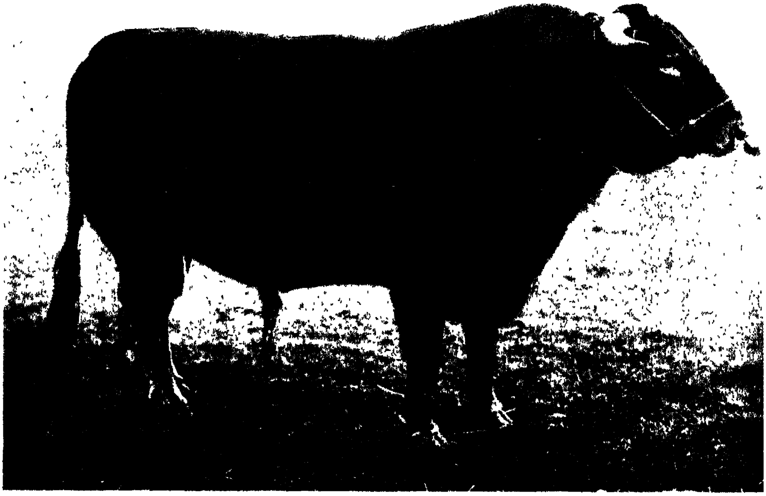


Fig. 3.—South Devon Bull, "Pamflete New Fashion."
Winner of Challenge Cup, Bristol, 1936.
Exhibited by Mr. J. Wakeham.

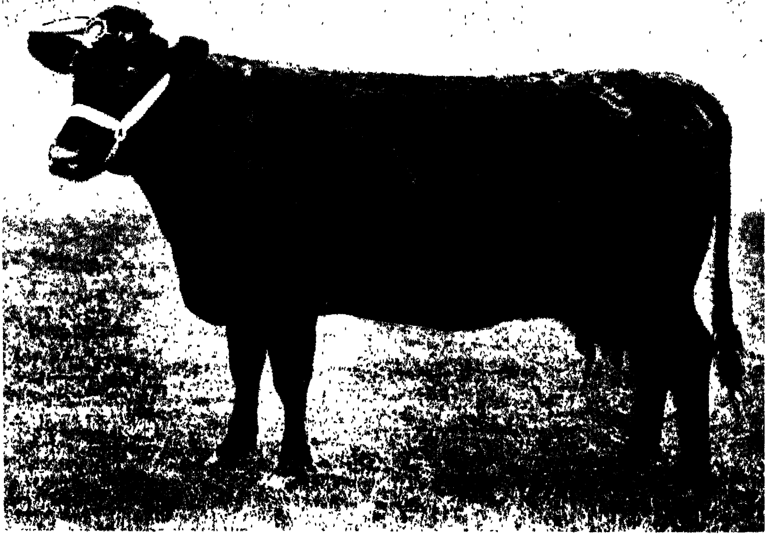


Fig. 4.—South Devon Cow, "Alston Lassie 5th."
Winner of Challenge Cup, Bristol, 1936.
Exhibited by Mr. J. Hendy.

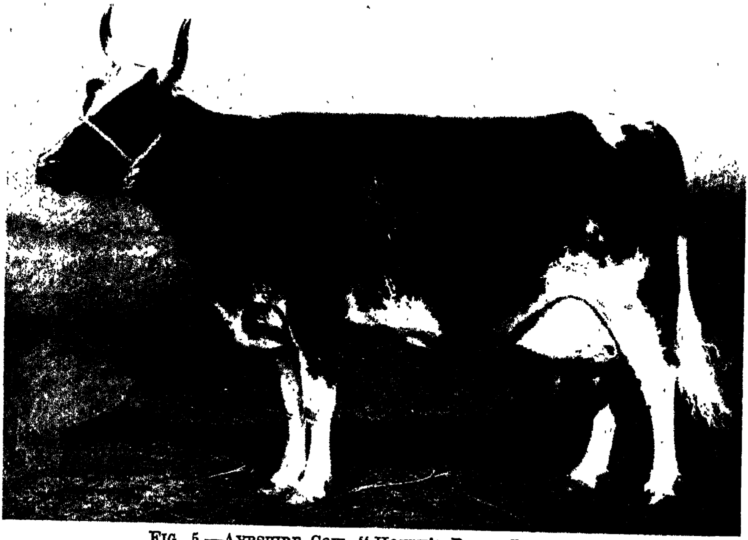


FIG. 5.—AYRSHIRE COW, "HOWIE'S DAIRY LASS 3RD."
Winner of "Cowhill" Challenge Cup, Bristol, 1936.
Exhibited by MESSRS. JAMES HOWIE & SONS.

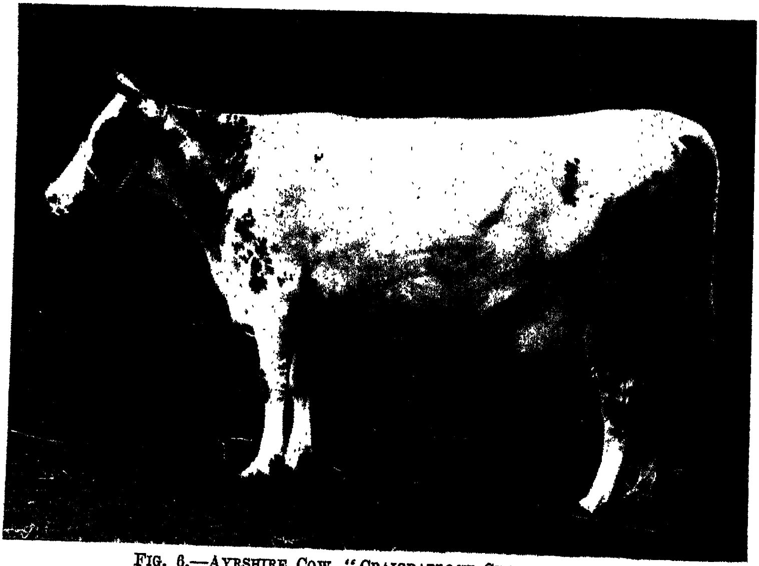


FIG. 6.—AYRSHIRE COW, "CRAIGRAPLOCH CUCUMBER 5TH."
Winner of "Oldner" Challenge Cup, Bristol, 1936.
Exhibited by MR. TREVOR GREENSHIELDS.

half-an-hour was spent by them admiring the exhibits. They then passed on to see the Model Allotment arranged under the scheme of the Society of Friends to enable unemployed men to grow their own garden produce. Here the Duchess took a fork and dug some potatoes, which, at her wish, were later sent on to Windsor. Next a visit was paid to the exhibition of the National Federation of Women's Institutes.

After luncheon in the Royal Pavilion, Their Royal Highnesses went to see the exhibits and demonstrations arranged by the Rural Industries Bureau. At this stand the Duchess delighted an elderly Welsh craftsman by accepting a pair of clogs he had made and by wearing them in the Showground. During her conversation with the clog-maker the Duchess heard that he had had his pocket picked. She organised a collection among her friends, and later handed to him £9 10*s*., the amount of his loss.

At three o'clock Their Royal Highnesses arrived at the Big Ring and took their seats in the Royal Box. What they saw in the Ring included part of the Cattle Parade, the parade of the Pipes and Drums of the Argyll and Sutherland Highlanders, the Royal Horse Artillery Musical Drive and the Duke of Beaufort's Hounds.

Visits were afterwards made to the Dairy, the Produce Tent and the Forestry Exhibition. Their Royal Highnesses walked through cheering crowds to the adjacent Royal Pavilion for tea, after which, at a quarter to six, they left for Badminton.

Letters in the following terms were received by the President and Hon. Director of the Show :—

11, Grosvenor Crescent, S.W.1,
July 7th, 1936.

" DEAR SIR MERRIK BURRELL,

" Thank you so much for your very kind letter, which I have shown to the Duke and Duchess of York.

" Their Royal Highnesses have asked me to thank you on their behalf for the very excellent arrangements you made for their visit to the Show at Bristol the other day. They fully realise what a lot of work and trouble it all meant, and were delighted with everything they saw, and thoroughly enjoyed their day (in spite of the rain).

" May I thank you again personally for the excellent advice and help which you gave me.

" Yours sincerely,
" (*Signed*) T. W. COKE."

SIR MERRIK BURRELL, Bart.

11, Grosvenor Crescent, S.W.1,
July 2nd, 1936.

"DEAR MR. BURKE,

"The Duke and Duchess of York have asked me to write to you and to thank you, on their behalf, for the very excellent arrangements that you made on the occasion of their visit to Bristol on Wednesday for the Agricultural Show.

"Their Royal Highnesses fully realised what a lot of work and trouble the arrangements entailed. These left nothing to be desired.

"Would you also please convey to Sir Merrik Burrell Their Royal Highnesses' very grateful thanks for the kind way in which he looked after them and showed them round the Show.

"May I say how much I enjoyed the Show myself, and I do hope that the bad weather won't have turned away too many people.

"Yours sincerely,
"(*Signed*) T. W. COKE, *Equerry*."

ROLAND BURKE, Esq.

During Wednesday the 15th International Dairy Cattle Judging Contest took place. Teams representing England, Scotland, Wales, Northern Ireland and the United States of America took part. England again won the Gold Cup, with the U.S.A. second. The others were placed in the following order: Scotland, Wales, Northern Ireland. For the individual top score, one of the American lads tied with a member of the English team, and the Society awarded an extra silver-gilt medal.

On Thursday the weather was again showery until about three o'clock, when the sky cleared and the sun appeared. Being market day in Bristol, the attendance was largely one of farmers. H.R.H. Prince Arthur of Connaught was expected at the Show, but a telegram was received expressing regret at his inability to be present.

The General Meeting of Governors and Members took place during the morning in the Conference Tent, when resolutions were unanimously passed thanking the Lord Mayor and Corporation and the Bristol Local Committee for all they had done to promote the success of the Show. A report of the meeting appears in the Appendix to this volume.

At 10 o'clock the judging commenced of exhibits of beef and dairy cattle, numbering 133 in eight classes, owned by members of Young Farmers' Clubs in the counties of Devon, Gloucester, Somerset and Wilts. In the afternoon the Young Farmers assembled in the enclosure in front of the Royal Pavilion, when the President made the presentation of the Gold Cup, medals, etc., awarded in the International Judging Contest, recalling, in a short address, how the Young Farmers movement had begun in Gloucestershire and had in a few years spread round the world. This little ceremony being finished, Young Farmers from the four counties paraded their animals in the Ring, preceded by the International teams carrying their national flags.

A party of the Bristol Engineering Manufacturers' Association paid an official visit to the Show, being welcomed by Colonel Stanyforth, Chairman of the Implement Committee, and Mr. John Bell, Implement Steward. They were shown round the Machinery exhibits by Mr. Wright, the Society's Consulting Engineer.

Amongst other visitors on Thursday were a small party of farmers who came by aeroplane from Leicester to Bristol Airport.

In the evening the Lord Mayor of Bristol entertained the Lord Mayor (Sir Percy Vincent, Bt.) and Sheriffs of the City of London to a Civic Banquet. Next morning (Friday), after an official reception at the Bristol Council House, the Lord Mayor of London, with the Sheriffs and the Recorder, drove in their state coaches to the Showground, where they were received by the President and Members of the Council. Having changed their ceremonial dress for macintoshes, the visitors inspected a number of exhibits, including those in the Flower Show. They were entertained to luncheon in the pavilion. In the afternoon they drove in the state coaches round the big ring to the Royal Box, from which they watched the riding and driving events and the military display. Sir Percy Vincent presented the Lord Mayor's Cup to the successful competitor in the Children's Pony classes.

It is a matter for regret that more or less continuous rain during the afternoon robbed the somewhat unusual proceedings of their full spectacular appeal.

The Lord Mayor of London and other civic dignitaries left the Show by car at 5 p.m.

A letter from Sir Percy Vincent is reproduced below :—

The Mansion House,
London, E.C.4.

"Dear Sir Merrik, July, 7th, 1936.

"I am writing to thank you for your very kind letter. I need not say how much I enjoyed the visit, and how much my thanks are due for all you did to make our stay an extremely happy and enjoyable one.

"I do hope that the results of the Show at Bristol this year will prove in every way satisfactory to you and your Council.

"Again, with many thanks and kindest regards,

"Yours sincerely,

"(*Signed*) PERCY VINCENT, *Lord Mayor*.

Sir Merrik Burrell, Bt.

On the closing day, Saturday, the weather was fine until late afternoon. In addition to the usual Ring events, judging took place of classes for Dartmoor and Exmoor ponies ridden by children, the competition for Mounted Police Horses, and a Mounted Vaulting and Gymnastic Display by the 60th Field Battery of the Royal Artillery.

Throughout the week the Ministry of Agriculture, in their special pavilion, had an interesting exhibition. Every day demonstrations were given of methods of grading and packing produce of various kinds under the National Mark scheme, and there was a continuous display of cinematograph films of agricultural interest, while exhibits of live animals illustrated grades under the Grade and Dead Weight scheme.

Horse-shoeing competitions were carried out by the National Master Farriers' and Blacksmiths' Association on the Wednesday, Thursday and Friday; and in the Honey department lectures and demonstrations were given under the auspices of the British Bee Keepers' Association.

With its picturesque roof of Norfolk reeds, the milk bar run by the National Milk Publicity Council added variety to the other Show erections. Here, for the first time at the Royal, were sold "champagne milk" and "milk shakes" of various descriptions. It was the first Bar to use the National Mark syrup made by a Bristol firm under the supervision of the authorities of the Long Ashton Research Station. It is understood that during the show some 570 gallons of milk, 70 gallons of ice cream and 18 pounds of Empire coffee were consumed at the Bar by customers numbering upwards of 11,000. Evidently the venture was a great success.

Good work was again done by the local branch of the Young Men's Christian Association for the attendants on the live stock, in the running of coffee bars and the organization of concerts, etc. On the Sunday before the Show a service for the stockmen was held in the large tent, when the preacher was the Bishop of Bristol.

Visitors during the week came from many parts of the Empire and from foreign countries, amongst those represented being Australia, New Zealand, South Africa, Kenya, Sweden, Denmark, Germany, Russia, the United States of America, the Argentine and other South American Republics.

Following will be found tables giving the numbers that passed the turnstiles at different periods on each day of the

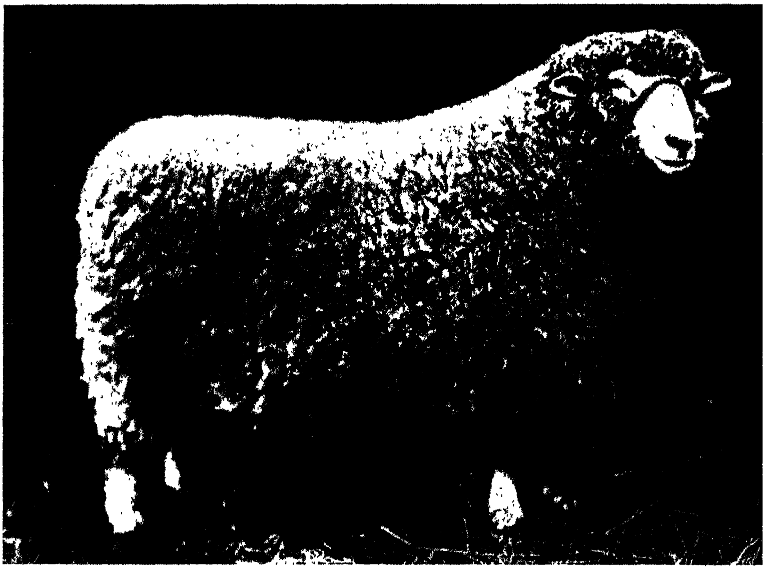


FIG. 7.—KENT OR ROMNEY MARSH SHEARLING RAM.
Winner of Champion Prize, Bristol, 1936.
Exhibited by MR. ASHLEY STEVENS.

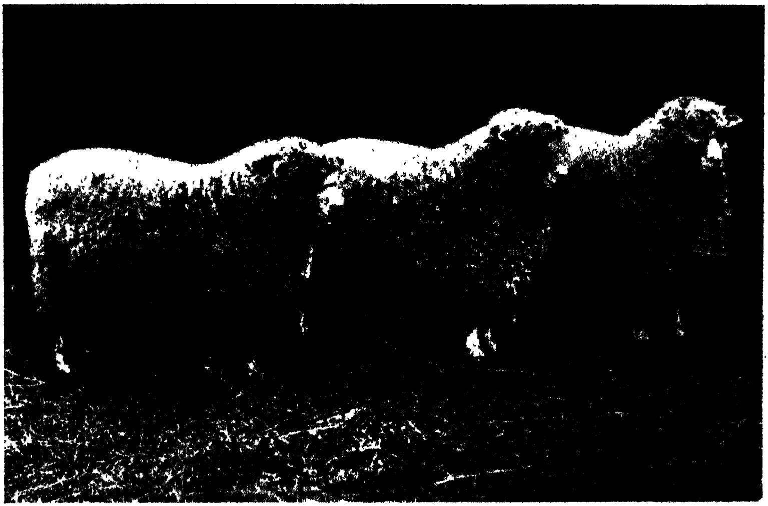


FIG. 8.—PEN OF THREE KENT OR ROMNEY MARSH SHEARLING EWES.
Winners of Champion Prize, Bristol, 1936.
Exhibited by MR. J. EGERTON QUESTED.

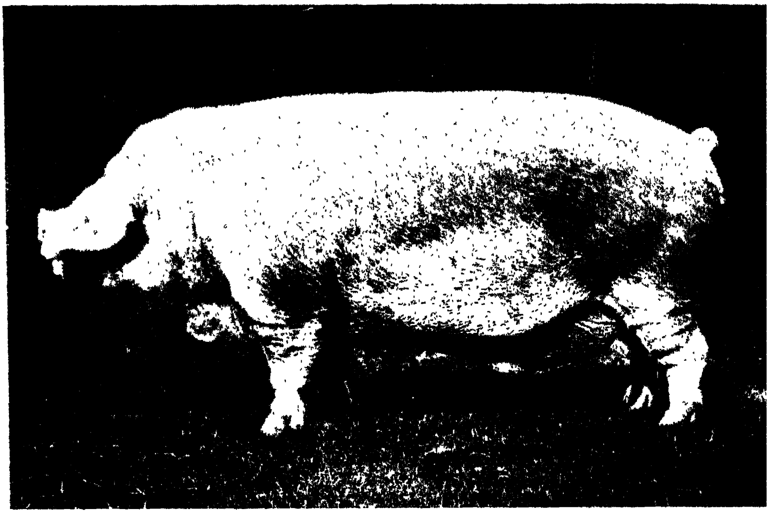


FIG. 9.—GLOUCESTERSHIRE OLD SPOTS BOAR, "CHALFIELD MICHAEL."
Winner of Challenge Cup, Bristol, 1936.
Exhibited by MR. S. C. FLOOK.

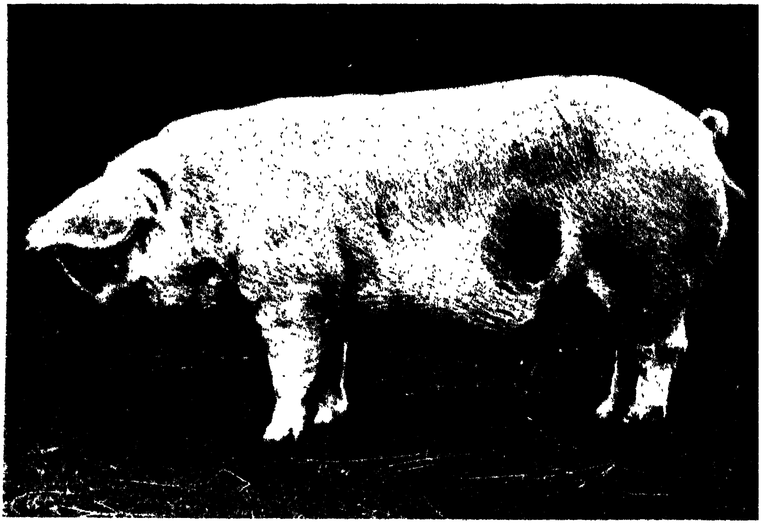


FIG. 10.—GLOUCESTERSHIRE OLD SPOTS SOW, "NASHES DUCHESS 57TH."
Winner of Champion Prizes for best G.O.S. Sow and best Pig of that Breed, Bristol, 1936.
Exhibited by MESSRS. SHERRIFF & SONS.

Show, together with each day's figures compared with previous Shows.

Admissions by Payment at Bristol.

Day of Show.	11 a.m.	1 p.m.	3 p.m.	5 p.m.	Day's Total.
Tuesday (5*s.*) .	1,593	3,077	3,720	4,042	4,089
Wednesday (5*s.*) . after 2 p.m. (3*s.*)	2,726	8,166*	12,657	14,578	14,873
Thursday (3*s.*) .	4,381	12,873	17,114	19,421	19,886
Friday (2*s.* 6*d.*) .	3,540	10,691	14,912	17,651	17,825
Saturday (1*s.*) .	3,290	6,298	11,149	15,742	16,133
Total for Show					72,806

* 2 p.m.

Total Daily Admissions at 1936 *Show compared with those of the previous six Shows and that at Bristol in* 1913.

Day of Show.	Bristol, 1936.	Newcastle, 1935.	Ipswich, 1934.	Derby, 1933.	Southampton, 1932.	Warwick, 1931.	Manchester, 1930.	Bristol, 1913.
First .	4,089	5,246	5,823	3,171	1,116	1,887	2,483	1,769
Second .	14,873	25,985	23,137	21,684	8,165	11,273	14,352	21,632
Third .	19,886	38,892	37,628	26,981	11,686	24,198	31,115	31,155
Fourth .	17,825	19,466	21,165	13,573	11,997	15,193	14,943	78,702
Fifth .	16,133	43,931	20,248	30,941	14,614	19,708	38,025	45,890
	72,806	133,520	107,001	96,350	47,578	72,259	100,918	179,148

Considering the abnormally wet weather, it is a matter for satisfaction that the loss on this year's Bristol Show was no more than £1,667.

T. B. TURNER.

REPORT ON NEW IMPLEMENTS ENTERED AT THE BRISTOL SHOW, 1936.

THE general opinion that more interest is being taken in agricultural machinery is confirmed on all hands, and the improvement in the general condition of agriculture is likely to make it possible for farmers to purchase renewals of plant that have been badly needed for some years. This interest is reflected in the increased number and variety of machines and implements that have been displayed at local county shows and other exhibitions. I was not surprised, therefore, to find on arriving at the Royal Show at Bristol an impressive collection on exhibition. Actually the amount of shed space and number of stands were less than when the Show was last held at Bristol in 1913, but compared favourably with the Shows of the last few years.

I feel that the general improvement which was to be seen was chiefly due to the introduction of rowcrop tractors and the increased numbers of implements adapted for rubber tyres, a departure which has been taken advantage of in all directions; grass mowers, binders, farm carts, and even wheelbarrows are now fitted with low-pressure rubber tyres.

Another thing that I found impressive was the exhibition of British-made machines, which was the finest I have seen since my first Royal Show in 1889. It was indeed a healthy sign and showed that British engineers are keenly alive to the situation; and Messrs. John Fowler & Co., and other old-established firms are to be congratulated on their efforts. The general layout of the Show also made possible a rapid survey, because the distances to be travelled were reduced to a minimum.

DESCRIPTION OF, AND AWARDS TO, MACHINES ENTERED FOR THE SILVER MEDALS.

As in former years, the Judges have personally inspected most of the entries at work, and have had the benefit of reports from the Society's Consulting Engineer and, in certain cases, from Research Institutes especially concerned with particular types of machinery.

The total number of entries was 9, but it was possible to award only two silver medals—one to Messrs. Bamlett's mowing machine and the other to the Allis-Chalmers All-Crop Harvester.

SUCCESSFUL ENTRIES.

I. *Horse-drawn Motor Mower—Entered in* 1935 *by Messrs. A. C. Bamlett, Ltd., Thirsk, and allowed to be re-entered by the same firm in* 1936. *Price* £37 10*s*.

This implement was tested last year and a description of its construction and working was given in the report on the 1935 entries. On that occasion the Judges of Implements considered that certain constructional details of the machine needed modification and in consequence deferred the entry. The machine as entered this year has been altered—

(1) By fitting pneumatic-tyred wheels in place of the ordinary ribbed mower wheels previously used;

(2) By arranging the wheel-track and shafts to allow the machine to straddle the wider swath resulting from a 6 feet cut;

(3) By placing the engine more centrally and making more adequate provision for taking the exhaust away.

The first two of these modifications are in accordance with the Judges' recommendations. With regard to the other recommendations, the engine is still almost uncomfortably near the driver's legs, and no safety device has been fitted to the cutter bar.

Two machines of the modified pattern were inspected at work this year. After replacing two broken poles—which were obviously due to a faulty batch of timber—the performance of the machines was satisfactory.

Those farmers who cut grass with tractor mowers driven direct from the engine of the tractor are satisfied that the cutting knives do their work more efficiently and with fewer stoppages than when the knives depend on the turn of the wheels of the mower as it is drawn along.

As stated in last year's report, the mower may not have any economical advantage on a large farm where modern tractors are available for use with power take-off mowers, but it has great possibilities on smaller farms where grass is the chief interest and only horses are kept. On such farms the hay harvest is likely to be the peak period for horse work and the mower enables one horse to pull a 6 feet cut at a greater speed and for a longer time daily than two horses would be able to pull a 4 feet 6 inches cutting machine. The Judges therefore felt that the machine, besides embodying a new principle, was of sufficient importance to farming in general to be worthy of a Silver Medal.

II. All-Crop Harvester—Entered by the Allis-Chalmers Manufacturing Co., 728, *Salisbury House, London Wall, E.C.2. Price* £230.

This is a small combine harvester which can be pulled by, and driven from the power take-off of, a medium-sized tractor. Its main novel feature is that the drum is of the same width (5 feet) as the cutter bar and is placed parallel to and in line with it. A short spring-tensioned canvas delivers the cut material to the beater type drum and the straw afterwards falls on to a vibrating straw-rack which replaces the shakers of normal machines. Other novel features are that the drum and concave are faced with rubber; that all drives are by Vee-belts running over adjustable sheave pulleys; and that the whole outfit is mounted on pneumatic tyres.

It was of course impossible to test a combine harvester in the period between the date for receiving entries and the Royal Show, but particulars were available of the performance of two similar machines which had worked on commercial farms in this country during last season. The first cut 110 acres of wheat, 110 acres of barley and 80 acres of oats between July 31st and

September 13th. The total working time for the 300 acres was 200 hours. The machine also cut about 30 acres of mustard seed during October and November. The farm on which it worked had been taken over in the previous year in a derelict condition, and consequently most of the crops were light, averaging only four to five sacks per acre. Some pieces, however, were heavier, and the machine cut these without difficulty, leaving no more stubble than a binder. On the whole, the machine did good work and made a clean sample, with very little loss of grain.

The second machine was used to cut about 60 acres of heavy crops of wheat and oats. I watched this machine at work during the whole of one day, and thought its work highly satisfactory.

The all-crop harvester is the first comparatively cheap combine. Its construction ensures that the straw is distributed uniformly over the surface of an unusually wide drum and enables it to deal with bulky crops. Also, since the speed of every pulley can be adjusted independently, it is possible to set the machine to thresh a wide range of crops efficiently. The power is taken from the tractor, thus cutting out an extra engine which would be used for only three or four weeks in the year and would be lying idle for the balance. Finally, the use of pneumatic tyres allows high cutting speeds to be used when conditions are suitable.

In the Judges' opinion, this machine is a distinct advance towards a combine suited to British conditions. It is reasonable in price, and its size makes it suitable for easy passage from one field to another. Its work is satisfactory, and it leaves the straw less broken than is the case with any other machine.

DEFERRED ENTRY.

III. Grass Drier—Entered by Sir Bernard Greenwell, Bart., Marden Park, Woldingham, Surrey. Price £200.

In this drier the material to be dried, together with the hot gases from a coke furnace, is sucked by a fan through about 80 feet of 8-inch diameter metal piping. The material then passes through the fan and is blown through a further short length of pipe to a cyclone, from which it falls to the ground. The main piping is in the form of a rectangular coil, and is completely enclosed in a lagged housing. The furnace is situated at the end of this housing, and is connected with it by a duct of fire-brick. The grass is fed by hand on to a small conveyor on the top of the drier and falls in a thin stream directly into the flame issuing from the furnace. The fan is driven by a 5-h.p. electric motor and the conveyor feed by a 1-h.p. motor.

During a short test of the machine 1,926 lb. of park grass, brought straight from where it had been cut, was partly dried in three batches, each batch being put twice through the drier, The results of the measurements made during this test were :—

Total weight of wet grass	1,926 lb.
Moisture content of wet grass	74·1 per cent.
Total weight of dried grass	803 lb.
Moisture content of partly dried grass	30·3 per cent.
Total time of drying	3 hours 12 minutes.
Electrical power consumed	13 kWh.
Coke consumed	241 lb.
Weight of water removed per lb. of coke	4·8 lb.
Rate of drying (twice through)	2½ cwt. dried material per hour.

The moisture content of the material after two passages through the drier was higher than would normally be considered safe for keeping in the bale. A further test on a portion of the material, however, showed that a third passage through the machine would reduce its moisture content sufficiently. Since the time of drying becomes progressively shorter for each stage, it is considered that if the whole of the material had been put through a third time the output would probably have been diminished by about 20 per cent., while the consumption of coke and power would have been increased by a corresponding amount.

An analysis of samples of the dried grass showed that the material was not in any way damaged by the drying process, and retained all its original feeding properties.

The Judges were of the opinion that by reason of its low cost and relative portability, this machine had distinct possibilities, but felt that it had not been in use long enough for them to come to any definite opinion as to its capabilities. However, they saw quite sufficient to induce them to defer the entry in the hope that, after further trial and development, it will be entered again next year.

UNSUCCESSFUL ENTRIES.

IV. *Rotary Cultivator—Entered by the B. H. Brown Engineering Co., Newcastle-on-Tyne, in* 1935, *and allowed to be re-entered this year by the makers, The Fishleigh Rotary Cultivator Co., Barnstaple. Price,* £70–£90, *according to working width.*

This implement was tested last year and a description of the machine and its working was given in the report on the 1935 entries. The Judges of Implements deferred the entry in order that they might be provided with additional information as to the practical utility of the machine in ordinary farm work. This information has been sought by direct enquiry from practical users of the machine, to a number of whom an enquiry was addressed with special reference to the following points :—

(1) How long the cultivator had been in use.
(2) For what types of work it was used.
(3) Whether it had, in the opinion of the user, definite advantages over ordinary methods of cultivation.

The replies, which were generally favourable to the machine, indicated that the purposes for which it had been used included fallow-making, seed-bed preparation, and the breaking-up of derelict pasture land. There was, however, no indication that any one user regarded the machine as having advantages for more than one particular operation, nor was there any unanimity of opinion as to which operation it was most suitable for. In these circumstances, and having regard to the fact that definite experimental evidence on the subject of rotary tillage is still lacking, the Judges did not feel sufficiently assured of the general utility of the machine to award it a medal.

V. Grassland Rejuvenator—Entered by Messrs. Bamford, Ltd., Uttoxeter. Price, £26 10s. without extras; cutting blade attachment for ant-hill removal, £5 5s.; interchangeable rake bars with wider spaced tines, £3 10s.

A widespread interest, largely inspired by the work of Professor Stapledon, is now being taken in new methods of dealing with grassland. The object is obviously to make it more profitable to stock farmers by feeding a larger head of live-stock than was formerly possible. The necessity has created a demand for a comparatively new form of equipment, *i.e.*, special harrows and rejuvenators. These implements and machines generally produce either a severe or superficial aeration of the land, the choice being made by the user. The production of these grassland implements has shown marked developments in the past year or so, and in Messrs. Bamford's the harrowing action is provided by two rakes arranged one behind the other and fitted with long closely-set rigid points which project through a cleaning grid. The rake bars are carried on levers pivoted at the front of a wheeled frame, and these are operated by cams connected with the land wheels, so that as the machine moves forward each bar in turn is momentarily withdrawn from the ground. When the bars are withdrawn in this way the cleaning grid removes debris from the tines. The debris left when the front bar is raised is collected by the rear bar, which in turn leaves it in a rough row on the ground. The depth of cut can be varied by means of weights on the levers, which can be slid nearer to or farther away from the fulcrum as required. The points normally fitted are spaced at 2½ inches apart, but interchangeable bars with points 5 inches apart can be supplied.

A further extra is a cutting blade attachment, which can be fitted at the front of the machine to remove old ant-hills which would otherwise damage the cleaning grid.

The machine was sent for trial to a well-known grassland authority, who provided a comprehensive report based on its work in a number of fields requiring treatment in different degrees of severity. In addition, the Judges had access to information based on several months' working, in other parts of the country, of two similar machines.

All the information available indicated that the machine was capable of doing excellent work on land requiring not too severe treatment. In these circumstances the cleaning mechanism worked well, while the treatment given to the land was adequate. Where a considerable quantity of dead material was present on the surface the self-cleaning was sometimes not so effective, while, on occasion, the presence of stones was a source of trouble. In very heavily matted land the action of the machine, while possibly as good as could be expected from any form of harrowing alone, was not sufficiently drastic.

The Judges recognized that the work of the Bamford Rejuvenator, under ordinary conditions of grassland rejuvenation, was at least as good as that of any other machine with which they were familiar. Having regard, however, to the facts that it could not adequately tackle badly matted land and that, unlike some other machines used with reasonable success for lighter types of work, it is definitely a single-purpose implement, they did not consider its advantages to be sufficiently outstanding to merit an award.

VI. Root Gapper—Entered by Messrs. E. H. Bentall & Co., Ltd., Maldon, Essex. Price not stated.

So long ago as 1922 the Ministry of Agriculture carried out some work on root gapping machines. The conclusions arrived at then were that the machines were considerably cheaper and a little faster than a team of four men. The tests were then made so that there was a possibility of gapping turnips by mechanical devices with no loss of total weight of the crop. It must, however, be remembered that the machines were not capable of singling. The gapper entered by Messrs. Bentall is very different in type from those tried out some fourteen years ago, but even so it is not perfect, possibly because sugar beet and mangold seeds are in little clumps, whereas turnip seed is in units. I am inclined to doubt whether a gapping machine for such crops will ever be designed that will be superior to hand work. The problem will, however, no doubt continue to attract the attention of the agricultural engineer, and each new attempt to solve it is meritorious. In the implement entered, a light steel frame is carried on two land wheels and is provided with stilt handles by means of which it can be steered. The land wheels are geared to a longitudinal shaft on which are mounted two segmented discs. The implement is pulled by one horse with its land wheels astride of a row of plants, and the rotating segmented discs cut gaps in the row at regular intervals. By changing the bevel pinion which drives the longitudinal shaft, three different spacings can be obtained, while by adjusting the distance apart of the two discs the length of the bunches of plants left between the gaps can be varied. Discs or other cleaning hoes can be fitted if required at the rear of the machine.

A short test was carried out in two fields of beet, one of which had been seeded at the rate of 17 lb. per acre and the other at the unusually heavy rate of 20 lb. per acre. The germination was good, so that even with the lighter seeding a good average plant was present before singling commenced. The trial rows were gapped with the machine at the same time as remaining rows were being singled in the normal manner with hand hoes. The men singling by hand were instructed to leave 80 plants to the chain—a spacing of roughly 10 inches in the row—and the machine was set to leave bunches at the same distance apart. Counts were made both on the machine-gapped rows and on some hand-singled work.

The results were as follows :—

	Average number of plants (or bunches) left per chain.
Hand-singled (seed rate,17 lb./acre) . . .	81
Machine-gapped (seed rate, 17 lb./acre) . .	64
,, ,, (,, ,, 20 lb./acre) . .	70

It was later reported by the farmer concerned that his men found the machine-gapped rows more difficult to single and that they required to be paid a correspondingly higher rate for piece work. The tests therefore showed that, in a plant of ordinary density in which hand workers were able to leave a full stand of 80 plants per chain, the mechanical gapper left only 80 per cent. of the theoretical number of bunches aimed at. On a heavier plant the gapper left 87 per cent. of the theoretical number of bunches. The Judges consider that the machine is probably the best mechanical gapper yet produced, but the losses consequent on its use would make the method uneconomic with a valuable crop such as sugar beet. With turnips or swedes these losses would not be so important, but here the more speedy and less costly method of cross hoeing with an ordinary horse hoe would be equally effective. The machine did not therefore appear to be worthy of an award.

VII. *Clifton Electric Sterilizer and Water Heater—Entered by J. W. Woolley & Co., Clifton. Tamworth. Price* £48.

This plant consists of a steam chest, boiler, water-feed device and separate water heater assembled as one unit. The steam chest measures 4 ft. × 3 ft. × 3 ft. nominal and is completely heat insulated. The boiler has a tubular circulating system giving quick steaming and is provided with two electrical heating elements with change-over connections for alternative loadings. An automatic time switch is provided. Steam is generated at atmospheric pressure and all condensate is returned to the boiler. The water heater is thermostatically controlled and is similar to those used for domestic purposes. It works quite independently of the rest of the outfit.

The sterilizer was tested under the Machinery Testing Scheme of the Ministry of Agriculture and during the test was used for twelve steamings under ordinary farm conditions. The time taken to raise the chest to 210°F. and to effect sterilization for ten minutes varied from fifty-seven to ninety-one minutes, according to the utensils with which the chest was filled.

The conclusions given in the certificate of performance issued by the Ministry were as follows :—

(1) When the plant was operated as recommended by the applicant, an effective sterilizing temperature (210°F.) was attained and maintained without difficulty.

(2) The plant was clean and effective in operation.

(3) It was fully automatic, the only attention required being the setting of the clock for the times of sterilization required and winding as necessary.

(4) Working costs were low.

The Judges felt that while the outfit appeared to be well constructed and thoroughly efficient, it had, apart from the incorporation of a separate water heater, no outstanding new feature. Nor did it appear to have any decided advantage over other models on the market.

VIII. *Manus Telescopic Teat Cup—Entered by Messrs. Fullwood & Bland,* 31, *Bevenden Street, London, N.*1. *Price not stated.*

This entry consists of a new type of teat cup applicable only to the Manus Milking Machine. The metal shell of the cup is made in two portions which telescope over one another. The rubber liner can therefore be inserted into the telescoped shell in an unstretched condition and is stretched automatically when the shell is opened again to its normal length. The advantages of the device are said to be that it makes the job of correctly inserting a liner very much easier, and also gives a longer life to rubber liners by enabling their tension to be released during steam sterilization.

During a test over a period of nine weeks the following observations were made :—

(1) The use of the new telescopic device makes it possible for the machine to be assembled and the rubber teat cup liners stretched in a satisfactory manner without the use of any stretching apparatus. A point which should be noted, but which applies equally to the old type and the telescopic type of Manus machine, was that considerable force was necessary to fix the mouthpiece of the teat cups, and this sometimes bent the metal parts of the teat cup.

(2) Teat cup liners which were steam sterilized in a state of tension lost their elasticity more quickly than those in which the telescopic teat cup was collapsed each time before sterilization.

(3) A possible defect of the telescopic device is that it increases the tendency for water of condensation to collect between the rubber liner and the metal shell of the teat cup during steam sterilization. It would probably be more accurate to describe this as making the teat cup less "fool proof" because, although the telescopic device admits water more freely, it also provides a simpler means of draining off the water after sterilization.

The principle of a telescopic teat cup appears to be sound, and the present device is an improvement on the older type of Manus Teat Cup. But, since it is applicable as yet only to one make of machine, the Judges did not consider its importance in practical dairy farming to be very great.

IX. "Claas" Patent Heavy Straw and Hay Press—Entered by D. Lorant, 28a, Watford Road, Radlett, Herts. Price £195.

The machine is a portable all-metal stationary press baler suitable for baling hay or straw. It consists of a steel frame spring mounted on four wheels, a hopper leading to a curved baling chamber and an overhead automatic rake feed (chain driven from the main driving gear), which pushes the material under the ram. The ram is constructed of heavy steel and is driven by connecting rods from the two main driving gear wheels.

The bales are tied automatically with three bands of binder twine or preferably sisal yarn.

The power is supplied by a belt drive from a farm tractor or engine of similar capacity.

The density of the bales can be regulated by a screw adjustment at the mouth of the baling chamber, and a safety device is fitted to prevent damage to the knotting mechanism.

Two long poles may be connected at the outlet to the bottom plate of the baling chamber to form a continuous chute along which the bales are pushed by the action of the ram and fed into a barn or stack, or on to a lorry.

Under test the machine was driven by a 10–20 tractor and used to bale both clover and meadow hay from a windrow. The work was done at an average rate of 2·7 tons per working hour with a team consisting of two men with motor-car sweeps, three men feeding (including the man in charge of tractor and baler), and one man loading the bales. The size of bale could be varied from 3 ft. 10 in. × 1 ft. 4 in. × 16 in. to 3 ft. 10 in. × 1 ft. 4 in. × 26 in. With clover hay the average weight of the largest size of bale was 135 lb. and of the smallest 70 lb.

The Judges came to the conclusion that there are many established British presses in operation, and that the machine entered seemed to offer no great advantages in operation or output over them, nor did it appear to them to embody any marked novelty in design that would justify the award of a medal.

THOMPSON CLOSE.

Ministry of Agriculture and Fisheries,
Whitehall Place, S.W.1.

REPORT OF THE STEWARD OF DAIRYING, BRISTOL SHOW, 1936.

MILK YIELD TRIALS.

CATTLE, CLASSES 236 TO 246 (inclusive).

THE Milk Yield Tests were carried out in accordance with the following regulations.

The prizes in the Milk Yield Classes will be awarded according to the following scale of points :—

One point for every 1 lb. milk.

One point for every completed ten days since calving, calculated to the first day of the Trials, deducting the first forty days.

One point shall be added for every ten days which have elapsed since the date of service of the Cow, deducting the first forty days of this period. No service is to date from less than forty days after the calving of the Cow. Maximum service points obtainable are twelve.

Table I.—MILK YIELD CLASSES AT BRISTOL, 1936.

Catalogue No.	Exhibitor.	Name of Cow.	Date of Birth.	Date of last Calf.	No. of days in Milk.	Date of last Service.	Milk Yield.								Average Fat percentage.	Points.					Awards and Remarks.
							Morning.		Noon.		Evening.		Total.			Milk.	Fat over 3 per cent. × 10.	Lactation.	Service.	Total.	
				1936		1936	Lb.	oz.	Lb.	oz.	Lb.	oz.	Lb.	oz.							
lass 236		Dairy Shorthorn. Thrice Milked.																			
1128	Capt. T. Allen-Stevens	Silverstream Melody	Mar. 26, 1928	May 28	32	—	34	4	21	12	23	4	79	4	3·91	79·25	9·10	Nil	Nil	88·35	Second Prize
1132	J. Pierpont Morgan	Aldenham Miss Darlington	Oct. 18, 1928	Mar. 27	94	—	21	4	16	12	17	8	55	8	2·58	55·50	—	5·40	Nil	60·90	Fat below standard
1136	Robert N. Tory	Bladen Kirklevington	Oct. 27, 1927	Mar. 28	93	May 30	26	4	19	12	19	8	65	8	3·31	65·50	3·10	5·30	Nil	73·90	Third Prize
1146	John Day	Huxham Duchess Rose 7th	Dec. 15, 1931	May 20	40	—	33	0	25	12	32	4	91	0	3·67	91·00	6·70	Nil	Nil	97·70	First Prize
1161	Duke of Westminster, G.C.V.O.	Eaton Marjorie 3rd	Aug. 3, 1931	June 2	27	—	17	0	15	4	14	12	47	0	4·34	47·00	13·40	Nil	Nil	60·40	H.C.
1163	G. H. Willis	Millbeck Benedict's Lucy 2nd	Feb. 16, 1931	May 22	38	—	23	12	20	8	19	12	64	0	3·41	64·00	4·10	Nil	Nil	68·10	Reserve
		Twice Milked.																			
1143	H. J. P. Atherton	Oxford Countess 6th	Oct. 9, 1931	June 10	19	—	23	0	—		23	4	46	4	3·61	46·25	6·10	Nil	Nil	52·35	H.C.
lass 237		Lincolnshire Red Shorthorn. Thrice Milked.																			
1233	Frank Sainsbury	Scothern Sensation 4th	July 23, 1929	June 2	27	—	27	0	21	4	20	12	69	0	2·91	69·00	—	Nil	Nil	69·00	Fat below standard
1236	John Evens & Son	Burton Ruby Spot 32nd	Sept. 21, 1931	Feb. 22	128	—	23	0	15	12	13	8	52	4	3·27	52·25	2·70	8·80	Nil	63·75	Reserve
1237	Frank Sainsbury	Wratting Milker 2nd	July 31, 1931	June 7	22	—	28	8	22	12	21	8	72	12	2·97	72·75	—	Nil	Nil	72·75	Fat below standard
1238	Scothern Dairy Co.	Lobthorpe Princess	Feb. , 1929	May 10	50	—	28	12	20	8	23	12	73	0	3·08	73·00	·80	1·00	Nil	74·80	First Prize
1240	Russell Wood	Bendish Cherry 37th	Sept. 9, 1930	May 23	37	—	24	8	18	8	22	0	65	0	3·86	65·00	8·60	Nil	Nil	73·60	Second Prize
1241	John Evens & Son	Burton Red Rose 10th	Jan. 8, 1932	May 17	43	—	27	8	20	12	17	4	65	8	3·24	65·50	2·40	·30	Nil	68·20	Third Prize
lass 239		Red Poll. Thrice Milked.																			
1341	Sir Woodman Burbidge, Bt.	Knepp Primula 3rd	April 20, 1930	June 15	14	—	17	4	12	8	12	0	41	12	4·10	41·75	11·00	Nil	Nil	52·75	—
1345	Lord Cranworth	Grundisburgh Good Luck	July 22, 1929	May 1	59	June 13	20	12	16	0	13	8	50	4	3·30	50·25	3·00	1·90	Nil	55·15	—
1357	Stuart Paul	Kirton Gretchen	Aug. 23, 1928	June 1	28	—	22	12	18	12	16	12	58	4	3·11	58·25	1·10	Nil	Nil	59·35	Third Prize
1358	Stuart Paul	Model Victoria	Oct. 6, 1923	June 8	21	—	27	8	20	4	20	8	68	4	4·12	68·25	11·20	Nil	Nil	79·45	Second Prize
1359	The Hon. Clive Pearson	Parham Dido	Oct. 18, 1930	May 6	54	—	17	12	18	8	17	4	53	8	2·82	53·50	—	1·40	Nil	54·90	Fat below standard
1362	Lt. Col. Sir Merrik R. Burrell, Bt., C.B.E.	Knepp Minerva 23rd	June 24, 1932	April 27	63	—	22	8	16	8	16	8	55	8	2·90	55·50	—	2·30	Nil	57·80	Fat below standard
1363	Lt. Col. Sir Merrik R. Burrell, Bt., C.B.E.	Knepp Royal Rosie 2nd	Sept. 26, 1931	April 28	62	—	25	0	21	8	17	12	64	4	2·77	64·25	—	2·20	Nil	66·45	Fat below standard
1373	N. A. Heywood	Glevering Siskin	Sept. 21, 1931	April 14	76	May 28	31	4	24	0	23	8	78	12	3·38	78·75	3·80	3·60	Nil	86·15	First Prize
1377	Mrs. G. Meinertzhagen	Morston Girl 21st	June 4, 1931	May 13	47	—	22	0	23	0	17	12	62	12	2·88	62·75	—	·70	Nil	63·45	Fat below standard
lass 240		Blue Albion. Thrice Milked.																			
1423	C. H. Webster	Ivonbrook Fancy	Aug. 15, 1932	May 28	32	—	21	8	16	0	15	8	53	0	5·34	53·00	23·40	Nil	Nil	76·40	First Prize
		Twice Milked.																			
1421	W. B. Glover	Mount Crocus 3rd	Aug. 11, 1929	June 7	22	—	23	8	—		25	4	48	12	4·12	48·75	11·20	Nil	Nil	59·95	Second Prize
1422	C. H. Goodwyn	Margaret 2nd of Crossfields	Jan. , 1932	June 3	26	—	29	8	—		35	4	64	12	2·66	64·75	—	Nil	Nil	64·75	Fat below standard

Class 241		British Friesian. Thrice Milked.															
1487	W. Curtis & Son	Ingatestone Myrtle Dewdrop	Feb. 26, 1927	May 21	39	—	35 12	25 12	23 4	84 12	2·65	84·75	—	Nil	Nil	84·75	Fat below standard
1491	Mrs. P. Tory	Holyport Arline	Oct. 2, 1928	June 15	14	—	28 4	20 8	20 12	69 8	3·41	59·50	4·10	Nil	Nil	73·60	First Prize
1492	Mrs. P. Tory	Penshurst Rosemary	Mar. 3, 1927	May 27	33	—	36 0	26 0	24 12	86 12	2·79	86·75	—	Nil	Nil	86·75	Fat below standard
1494	F. J. Carter	Bowerchalke Sweet Rose	Oct. 12, 1931	April 26	64	—	29 12	25 8	22 4	77 8	2·46	77·50	—	2·40	Nil	79·90	Fat below standard
1495	W. Curtis & Son	Abingworth Graceful	Oct. 11, 1931	April 5	85	—	34 8	27 4	26 8	88 4	2·82	88·25	—	4·50	Nil	92·75	Fat below standard
1504	James Kilpatrick	Craigiemains Lady Ada	Jan. 16, 1931	May 26	34	—	38 4	30 0	28 0	96 4	2·89	96·25	—	Nil	Nil	96·25	Fat below standard
1510	Strutt & Parker (Farms) Ltd.	Lavenham Beechnut 3rd	Aug. 6, 1931	June 5	24	—	29 8	19 8	21 12	70 12	2·30	70·75	—	Nil	Nil	70·75	Fat below standard
Class 242		Ayrshire. Thrice Milked.															
1553	Alex. Cochrane	Drumfork Babs	Aug. 16, 1929	June 13	16	—	20 4	15 4	15 0	50 8	3·64	50·50	6·40	Nil	Nil	56·90	Reserve
1568	Edinburgh University Institute of Animal Genetics	Auchenbrain Miss Craig 67th	Mar. 4, 1930	May 30	30	—	24 8	19 8	19 0	63 0	3·35	63·00	3·50	Nil	Nil	66·50	Third Prize
1570	Edinburgh University Institute of Animal Genetics	Linnhead Olive 7th	Jan. 29, 1931	June 7	22	—	30 0	22 8	20 8	73 0	3·86	73·00	8·60	Nil	Nil	81·60	First Prize
1578	J. R. P. Hedley	Chapelhill Yvonne	Jan. , 1928	May 15	45	—	29 8	26 0	20 0	75 8	3·19	75·50	1·90	·50	Nil	77·90	Second Prize
1579	A. W. Montgomerie	Cauldhame Katerine 6th	July 9, 1931	June 7	22	—	18 0	11 12	11 12	41 8	3·93	41·50	9·30	Nil	Nil	50·80	H.C.
Class 243		Guernsey. Thrice Milked.															
1662	Capt. Cosmo Douglas	Hazelby Meadow Sweet	Sept. 16, 1926	May 10	50	—	20 12	17 8	16 8	54 12	3·73	54·75	7·30	1·00	Nil	63·05	H.C.
1664	H. A. Y. Dyson.	Princess May des Landes Farm	Oct. 4, 1929	April 8	82	—	27 0	17 12	18 4	63 0	2·59	63·00	—	4·20	Nil	67·20	Fat below standard
1665	Carl Holmes	Dairy Queen 2nd of Clover Top	Dec. 23, 1930	April 19	71	June 7	24 12	15 12	15 0	55 8	4·05	55·50	10·50	3·10	Nil	69·10	Reserve
1676	Mrs. J. Sutcliffe Pyman	Sequels Maybelle 6th	Nov. 25, 1931	April 20	70	—	22 8	19 0	18 4	59 12	3·26	59·75	2·60	3·00	Nil	65·35	H.C.
1677	Eric H. Rose	Pansy of Les Poidevins	Sept. 25, 1928	June 4	25	—	22 8	16 8	16 4	55 4	3·69	55·25	6·90	Nil	Nil	62·15	H.C.
1678	H. H. Scott	Rose of Goodnestone 15th	June 24, 1931	April 9	81	—	17 12	18 4	16 0	52 0	4·85	52·00	18·50	4·10	Nil	74·60	Third Prize
1688	Carl Holmes	Dairy Queen 3rd of Clover Top	June 25, 1932	Feb. 2	148	May 3	23 4	17 4	16 8	57 0	4·32	57·00	13·20	10·8	1·70	82·70	Second Prize
1701	Lord Swaythling	Bladen Gay Lass 2nd	May 15, 1932	Jan. 31	150	—	28 8	20 0	19 4	67 12	3·41	67·75	4·10	11·00	Nil	82·85	First Prize
		Twice Milked.															
1671	Mrs. E. Mansfield	Tyndall Park Nellie's Sequence 2nd	June 15, 1929	Mar. 30	91	June 21	18 12	—	24 8	43 4	5·13	43·25	21·30	5·10	Nil	69·65	Fourth Prize
1689	H. B. Hornby	Keynsham Slogan's Beauty	Aug. 31, 1933	May 24	36	—	16 8	—	18 8	35 0	4·31	35·00	13·10	Nil	Nil	48·10	H.C.
Class 244		Jersey. Thrice Milked.															
1791	Grosvenor Berry	Black Art's Post Girl	Mar. 20, 1928	April 7	83	June 21	22 4	17 12	17 12	57 12	3·86	57·75	8·60	4·30	Nil	70·65	H.C.
1792	Grosvenor Berry	Easter Dinah	April 8, 1931	Feb. 22	128	June 19	24 0	17 4	17 12	59 ·0	3·90	59·00	9·00	8·80	Nil	76·80	Fifth Prize
1793	Grosvenor Berry	May Day	May 1, 1928	Dec. 27, 1935	185	April 1	19 8	13 4	12 4	45 0	4·51	45·00	15·10	14·50	4·90	79·50	Third Prize
1795	Mrs. G. J. Caddey	Cambrais Elfa 2nd	Nov. 10, 1930	June 1936	24	—	23 0	16 4	15 4	54 8	5·43	54·50	24·30	Nil	Nil	78·80	Fourth Prize
1798	G. H. Flamank	Forsythia	Dec. 30, 1929	May 11	49	—	18 8	12 4	12 4	43 0	3·93	43·00	9·30	·09	Nil	53·20	H.C.
1799	Mrs. Henry Hawkins	Everdon Rustic Maid	Aug. 24, 1932	Mar. 6	115	June 1	22 0	14 8	13 0	49 8	3·82	49·50	8·20	7·50	Nil	65·20	H.C.
1804	S. S. Lockwood	Normanby Chloe	April 3, 1931	April 23	67	—	24 12	19 8	16 12	61 0	4·98	61·00	19·80	2·70	Nil	83·50	First Prize
1806	James Walker McCallum	Pearcelands Eileen 10th	July 2, 1931	Mar. 29	92	June 17	25 8	17 8	16 12	59 12	4·62	59·75	16·20	5·20	Nil	81·15	Second Prize
1807	Gordon McWilliam	Bollhayes Conceit's Leda.	May 6, 1932	April 25	65	—	20 4	14 8	13 4	48 0	3·71	48·00	7·10	2·50	Nil	57·60	H.C.
1808	Gordon McWilliam	Bollhayes Maid's Beauty	April 14, 1930	Feb. 24	126	May 19	15 0	10 8	11 12	37 4	3·70	37·25	7·00	8·60	·10	52·95	H.C.
1809	W. H. Morgan	Zellina's Witch	Aug. 28, 1931	Mar. 25	96	—	15 8	11 12	11 12	39 0	3·49	39·00	4·90	5·60	Nil	49·50	H.C.
1819	Ovaltine Dairy Farm	Sunray of Oaklands	Oct. 12, 1930	April 25	65	—	24 0	15 4	14 8	53 12	4·06	53·75	10·60	2·50	Nil	66·85	H.C.
1820	H. Leyborne Popham	Hunstrete Empress Doreen	Sept. 8, 1929	April 17	73	—	20 4	14 12	14 12	49 12	4·30	49·75	13·00	3·30	Nil	66·05	H.C.
1831	Wm. A. White	Hunstanton Alexandra	Sept. 5, 1931	June 5	24	—	22 4	16 0	14 4	52 8	4·69	52·50	16·90	Nil	Nil	69·40	H.C.

TABLE I.—MILK YIELD CLASSES AT BRISTOL, 1936 (*continued*).

Catalogue No.	Exhibitor.	Name of Cow.	Date of Birth.	Date of last Calf.	No. of days in Milk.	Date of last Service.	Milk Yield. Morning.		Noon.		Evening.		Total.		Average Fat percentage.	Points. Milk.	Fat over 3 per cent. × 10.	Lactation.	Service.	Total.	Awards and Remarks.
				1936		1936	Lb.	oz.	Lb.	oz.	Lb.	oz.	Lb.	oz.							
		Twice Milked.																			
1790	Miss Marjory G. Barrow	Hameringham Nightshade	Mar. 16, 1931	Feb. 8	147	June 2	16	4	—		29	12	46	0	3·39	46·00	3·90	10·70	Nil	60·60	H.C.
1801	Mrs. Henry Hawkins	Gold Bell	Nov. 9, 1931	Mar. 16	105	June 5	18	8	—		18	12	37	4	4·38	37·25	13·80	6·50	Nil	57·55	H.C.
1810	H. S. Mountain	Sir Laurence's Beauty Sleep	May 30, 1928	Jan. 25	156	May 16	25	4	—		21	12	47	0	3·98	47·00	9·80	11·60	·40	68·80	H.C.
1822	William E. Press	Diamond Buckle	May 14, 1932	May 12	48	—	17	0	—		19	12	36	12	4·08	36·75	10·80	·80	Nil	48·35	H.C.
1823	The Ladies Constance Ryder and Audrey Anson	Maid o' the Moor	Sept. 15, 1931	Mar. 16	105	May 31	18	0	—		18	4	36	4	6·21	36·25	32·10	6·50	Nil	74·85	Reserve
1824	Mrs. Hayes Sadler	Charlton Abbotts Oxford's Velveteen 3rd	June 17, 1932	Mar. 7	114	June 3	15	4	—		15	12	31	0	4·19	31·00	11·90	7·40	Nil	50·30	H.C.
1864	Wm. A. White	Woodfold Glorania	May 25, 1934	May 17	43	—	17	4	—		16	8	33	12	5·07	33·75	20·70	·30	Nil	54·75	H.C.
Class 245		Kerry. Thrice Milked.																			
1898	Lt.-Col. J. A. Innes, D.S.O.	Ard Cacin Doe	Dec. 23, 1930	May 31	29	—	21	8	16	8	15	8	53	8	3·91	53·50	9·10	Nil	Nil	62·60	First Prize and Elmhurst Cup
1900	Kerry Cow Dairy Farms	Drumgaunagh Eliza	Feb. 28, 1927	May 24	36	—	18	12	13	4	13	0	45	0	3·73	45·00	7·30	—	—	52·30	Reserve
1901	H. E. Mitchell	Castle Lough Emerald	April 15, 1929	April 13	77	—	11	0	8	4	8	12	28	0	3·64	28·00	6·40	3·70	—	38·10	—
1902	Newton R. Steel	Hookland Angela	Jan. 12, 1930	April 30	60	—	18	0	14	0	14	0	46	0	3·70	46·00	7·00	2·00	Nil	55·00	Third Prize
		Twice Milked.																			
1903	Bertram W. A. Watney	Brookwood Anne	Dec. 21, 1929	May 6	54	—	23	4	—		22	8	45	12	4·20	45·75	12·00	1·40	Nil	59·15	Second Prize and Reserve for Elmhurst Cup
Class 246		Dexter. Thrice Milked.																			
1927	Lady Loder	Grinstead Lavender 4th	May 22, 1930	April 20	70	—	15	12	12	8	12	12	41	0	3·24	41·00	2·40	3·00	Nil	46·40	Reserve
		Twice Milked.																			
1924	Mrs. C. M. L. Calvert	Wishbone of Exmoor	Jan. 28, 1927	April 30	60	—	19	4	—		20	8	39	12	3·67	39·75	6·70	2·00	Nil	48·45	Third Prize
1925	Comtesse Elizabeth de Prét Roose	Ratcliffe Partridge	Sept. 1, 1927	Mar. 18	103	—	14	4	—		16	0	30	4	5·12	30·25	21·20	6·30	Nil	57·75	Second Prize and Reserve Dexter Society Cup
1929	Mrs. T. H. Peyton	Colomendy Gay	May 23, 1927	May 5	55	—	16	12	—		15	12	32	8	3·11	32·50	1·10	1·50	Nil	35·10	—
1930	Capt. J. R. Statter	Oakridge Bud	April 18, 1930	June 5	24	—	20	12	—		20	12	41	8	4·67	41·50	16·70	Nil	Nil	58·20	First Prize and Dexter Society Cup
1937	Mrs. T. H. Peyton	Colomendy Mary 4th	June 4, 1934	May 17	43	—	13	8	—		13	12	27	4	2·86	27·25	—	·30	Nil	27·55	Fat below standard

Ten points for every 1 per cent. of butter-fat over 3 per cent. shown on the average of the percentages of fat found in the two or three milkings, this average being calculated by multiplying the percentage of butter-fat by the weight of milk obtained at each milking.

Cows whose milk shows less than 3 per cent. of butter-fat, reckoned on an average of the fat percentages found in the two or three milkings, will be disqualified.

No Prize of Commendation will be awarded to Cattle which do not obtain the following points :—

	Cows 5 years and over on the first day of the Show.	Cows and Heifers under 5 years on the first day of the Show.
Dairy Shorthorn, Lincolnshire Red Shorthorn, South Devon, Red Poll, Blue Albion or British Friesian . .	56 points	50 points
Ayrshire, Guernsey or Jersey . . .	51 ,,	45 ,,
Kerry or Dexter	41 ,,	35 ,,

In the case of cows obtaining the same number of points, the prize will be awarded to the cow which has been the longest time in milk.

Highly Commended Cards will be awarded to all animals, other than winners of the prizes, which reach the above standard.

Of the 102 cows entered for the Milking Trials, 79 competed, 18 of which were milked twice daily.

TABLE II.—*Average Performance of the various Breeds* :—

A.—TWICE MILKED.

No. of Cows.	Breed.	Days in Milk.	Milk Yield.		Fat percentage.	Total Points.
			Lb.	oz.		
1	Dairy Shorthorn . .	19	46	4	3·61	52·35
2	Blue Albion . . .	24	56	12	3·39	62·35
2	Guernsey . . .	63	39	2	4·72	58·88
7	Jersey	103	38	4½	4·47	59·31
1	Kerry	54	45	12	4·20	59·15
5	Dexter	57	34	4	3·89	45·41
	B.—THRICE MILKED.					
6	Dairy Shorthorn . .	54	67	0½	3·54	74·89
6	Lincoln Red . . .	51	66	4	3·22	70·35
9	Red Poll	47	59	4	3·26	63·94
1	Blue Albion . . .	32	53	0	5·34	76·40
7	British Friesian . .	42	81	15	2·76	83·54
5	Ayrshire	27	60	11	3·59	66·74
8	Guernsey . . .	85	58	2	3·74	70·88
14	Jersey	85	50	11¼	4·21	67·94
4	Kerry	51	43	2	3·75	52·00
1	Dexter	70	41	0	3·24	46·40

In CLASS 236—*Dairy Shorthorn Cows and Heifers*—of the seven animals competing six fulfilled the requisite conditions. The premier place in this class was held by J. Day's cow "Huxham Duchess Rose 7th," with a milk yield of 91 lb. of an average fat percentage of 3·67. Her total points amounted to 97·7.

In CLASS 237—*Lincolnshire Red Shorthorn Cows and Heifers*—of the six animals competing two failed to reached the required standard.

The first-prize cow in this class was "Lobthorpe Princess" from the herd of the Scothern Dairy Company. This animal yielded 73 lb. milk, with a fat percentage of 3·08. Her total points amounted to 74·80.

CLASS 238.—*South Devon Cows and Heifers*—was cancelled.

In CLASS 239—*Red Poll Cows or Heifers*—nine animals were tested, six of which failed to fulfil the conditions governing the award of prizes.

The premier award went to N. A. Heywood's cow "Glevering Siskin" with a milk yield of 78¾ lb., a fat percentage of 3·38 and 86·15 total points.

CLASS 240.—*Blue Albion Cows or Heifers.*

Of the three animals competing in this class, two qualified. The winner—C. H. Webster's cow "Ivonbrook Fancy"—yielded 53 lb. milk, with an average fat percentage of 5·34 and 76·4 total points.

CLASS 241.—*British Friesians.*

Seven animals competed in this class. Their performance was not quite up to the usual standard. Mrs. P. Tory's cow "Holyport Arline" was awarded the first prize in her class, with a yield of 69·8 lb. milk containing an average of 3·41 per cent. fat. Her total points were 73·60.

CLASS 242.—*Ayrshires.*

Five cows competed in this class, all of which reached the standard points. The Edinburgh University Institute of Animal Genetics' cow "Linnhead Olive 7th" held the premier place, her milk yield amounting to 73 lb., with an average fat percentage of 3·86 and 81·6 total points.

CLASS 243.—*Guernseys.*

Ten Guernseys were tested. Lord Swaythling's cow "Bladen Gay Lass 2nd" was awarded the first prize in this class, with a milk yield of 67·12 lb., an average fat percentage of 3·41 and 82·85 points. Only one of the ten cows tested failed to fulfil the conditions governing the competition.

CLASS 244.—*Jerseys.*

Twenty-one Jerseys competed, seven of which were twice-milkers. It is interesting to note that all prize winners in this class were thrice milked.

S. S. Lockwood's cow "Normamby Chloe" was awarded the first prize in her class. Her milk yield amounted to 61·0 lb., with an average fat percentage of 4·98, and 83·5 points.

CLASS 245.—*Kerries.*

Five competed, the winner being Lt.-Col. J. A. Innes' cow "Ard Cæin Doe," her milk yield amounting to 53·8 lb., with an average fat percentage of 3·91, and 62·6 total points.

CLASS 246.—*Dexters.*

Of the six Dexters tested, Capt. J. R. Statter's cow "Oakbridge Bud" won the premier honours in her class, her milk yield amounting to 41·8 lb., showing an average fat percentage of 4·67. Her total points were 58·20.

TABLE III.—*Average Results in Milk Trial Classes.*

No. of Cows competing.	Breed.	Days in Milk.	Yield of Milk.		Fat percentage.	Total Points.
			Lb.	oz.		
7	Dairy Shorthorn	49	64	1	3·55	71·67
6	Lincoln Red	51	66	4	3·22	70·35
9	Red Poll	47	59	4	3·26	63·94
3	Blue Albion	27	55	8	4·04	67·03
7	British Friesian	42	81	15	2·76	83·54
5	Ayrshire	27	60	11	3·59	66·74
10	Guernsey	80	54	5	3·93	68·48
21	Jersey	91	46	9	4·30	65·06
5	Kerry	51	43	10	3·84	53·43
6	Dexter	60	35	6	3·78	45·57

As compared with the 1935 Milk Tests at Newcastle there appears a marked improvement in the performance of the following breeds :—

Red Poll, Blue Albion, Guernsey, Kerry, and a slight falling off in British Friesian, Jersey and Dexter.

Sixteen animals of the 79 competing failed to qualify for a prize owing to the average fat percentage falling below the requisite 3 per cent., and three more owing to their failure to obtain the requisite number of points.

BUTTER TEST TRIALS.

Classes 247 and 248.

Fifty-three animals competed out of a total entry of 71. Seven of these were twice-milkers, and 46 thrice-milkers.

The following table gives the average results of the two classes of milkers.

Table IV.

A.—TWICE-MILKERS.

No. of Cows.	Breed.	Days in Milk.	Yield of Milk.	Butter.	Ratio.	Points.
			Lb. oz.	Lb. oz.	Lb.	
1	Guernsey	91	43 4	2 6	18·21	52·10
5	Jersey	105	37 10	1 11½	22·64	42·04
1	Blue Albion	22	48 12	2 2	22·94	44·00
	B.—THRICE MILKED.					
7	Guernsey	87	57 14	1 14½	31·22	43·13
16	Jersey	97	49 5	2 0¾	24·76	48·05
2	Kerry	33	49 4	1 13	27·27	36·38
1	Devon	30	52 4	1 13¾	28·10	38·75
3	Dairy Shorthorn	75	61 10½	1 7¼	46·59	32·23
5	Lincoln Red	51	64 14½	1 10½	40·90	35·22
4	Red Poll	48	59 3	1 7¼	41·31	29·36
7	British Friesian	42	81 15½	2 2¾	38·25	42·45
1	Ayrshire	16	50 8	1 13¼	27·62	37·25

Table V.—*Average Results of Breeds in Butter Tests.*

No. Competing.	Breed.	Days in Milk.	Yield of Milk.	Yield of Butter.	Butter Ratio.	Points.
			Lb. oz.	Lb. oz.	Lb.	
8	Guernsey	87	56 1	1 15½	29·59	44·25
21	Jersey	99	46 8½	1 15½	24·25	46·62
2	Kerry	33	49 4	1 13	27·27	36·38
1	Devon	30	52 4	1 13¾	28·10	38·75
3	Dairy Shorthorn	75	61 10½	1 7¼	46·59	32·23
5	Lincoln Red	51	64 14½	1 10½	40·90	35·22
4	Red Poll	48	59 3	1 7¼	41·31	29·36
7	British Friesian	42	81 15½	2 2¾	38·25	42·45
1	Ayrshire	16	50 8	1 13¼	27·62	37·25
1	Blue Albion	22	48 12	2 2	22·94	44·00

As compared with last year's results at Newcastle, the average points are slightly down in most breeds. The Jersey, Lincoln Red and Ayrshire cattle show an increase. The Shorthorns show a decrease of about 12 points.

Ten animals failed to qualify owing to not obtaining sufficient points, and 22 others owing to the butter ratio being above 1 : 30.

TABLE VI.—RESULTS OF BUTTER TESTS AT BRISTOL, 1936.

CLASS 247.—COWS OF GUERNSEY, JERSEY, KERRY OR DEXTER BREEDS.

No. in Catalogue	Exhibitor.	Name of Cow.	Date of Birth.	Date of last Calf.	No. of Days in Milk.	Date of last Service	Milk Yield in 24 hours.	Butter Yield.	Ratio, viz. lb. milk to lb Butter.	No. of Points for Butter.	No. of Points for Lactation.	No. of Points for Service.	No. of Points for Quality of Butter	Total No. of Points.	Awards and Remarks.
		Guernsey. Thrice milked.		1936			Lb. oz.	Lb. oz.							
1662	Capt. Cosmo Douglas	Hazelby Meadow Sweet	Sept. 16, 1926	May 10	50	—	54 12	1 13¼	29·95	29·25	1·00	Nil	8·00	38·25	Insufficient points.
1664	H. A. Y. Dyson	Princess May des Landes Farm	Oct. 4, 1929	April 8	82	—	63 0	1 6¼	45·30	22·25	4·20	Nil	2·00	28·45	Ratio over 30.
1665	Carl Holmes	Dairy Queen 2nd of Clover Top	Dec. 28, 1930	April 19	71	June 7	55 8	2 2½	25·74	34·50	3·10	Nil	7·00	44·60	H.C. and E.G.C.S., Cert. of Merit.
1677	Eric H. Rose	Pansy of Les Poidevins	Sept. 25, 1928	June 4	25	—	55 4	1 11½	32·15	27·50	Nil	Nil	8·00	35·50	Ratio over 30.
1678	H. H. Scott	Rose of Goodnestone 15th.	June 24, 1931	April 9	81	—	52 0	1 14½	27·28	30·50	4·10	Nil	9·00	43·60	H.C. and E.G.C.S., Cert. of Merit.
1688	Carl Holmes	Dairy Queen 3rd of Clover Top	June 25, 1932	Feb. 2	148	May 3	57 0	2 6½	23·69	38·50	10·80	1·70	9·00	60·00	Third Prize.
1701	Lord Swaythling	Bladen Gay Lass 2nd	May 15, 1932	Jan. 31	150	—	67 12	1 15½	34·41	31·50	11·00	Nil	9·00	51·50	Ratio over 30.
		Guernsey. Twice milked.													
1671	Mrs. E. Mansfield	Tyndall Park Nellie's Sequence 2nd	June 15, 1929	Mar. 30	91	June 21	43 4	2 6	18·21	38·00	5·10	Nil	9·00	52·10	H.C. and E.G.C.S., Cert. of Merit.
		Jersey. Thrice milked.													
1791	Grosvenor Berry	Black Art's Post Girl	Mar. 20, 1928	April 7	83	June 21	57 12	2 2¾	26·59	34·75	4·30	Nil	9·00	48·05	H.C. and E.J.C.S., Cert. of Merit.
1792	Grosvenor Berry	Easter Dinah	April 8, 1931	Feb. 22	128	June 19	59 0	2 0½	29·05	32·50	8·80	Nil	8·00	49·30	H.C. and E.J.C.S., Cert. of Merit.
				1935											
1793	Grosvenor Berry	May Day	May 1, 1928	Dec. 27	185	April 1	45 0	2 0¼	22·33	32·25	14·50	4·90	8·00	59·65	Fourth Prize and E.J.C.S. Bronze Medal.
				1936											
1795	Mrs. G. J. Caddey	Cambrale Elfa 2nd	Nov. 10, 1930	June 5	24	—	54 8	2 10½	20·52	42·50	Nil	Nil	9·00	51·50	H.C. and E.J.C.S., Cert. of Merit.
				1935											
1797	G. E. Flamank	Beauvoir Harmony	Aug. 27, 1929	Sept. 27	276	Jan. 20	40 4	2 3¾	18·01	35·75	23·60	12·00	9·00	80·35	First Prize, Champion Gold Medal, E.J.C.S. Gold M.
				1936											
1798	G. E. Flamank	Forsythia	Dec. 30, 1929	May 11	49	—	43 0	1 9½	26·98	25·50	·90	Nil	9·00	35·40	Insufficient points.
1799	Mrs. Henry Hawkins	Everdon Rustic Maid	Aug. 24, 1932	Mar. 6	115	June 1	49 8	1 14½	25·97	30·50	7·50	Nil	8·00	46·00	H.C. and E.J.C.S., Cert. of Merit.
1804	S. S. Lockwood	Normanby Chloe	April 3, 1931	April 23	67	—	61 0	3 3½	18·95	51·50	2·70	Nil	9·00	63·20	Second Prize Reserve for Champion Gold Medal, and E.J.C.S. Silver Medal.

TABLE VI.—RESULTS OF BUTTER TESTS AT BRISTOL, 1936.—*continued*

CLASS 247.—COWS OF GUERNSEY, JERSEY, KERRY OR DEXTER BREEDS.

No. in Catalogue	Exhibitor.	Name of Cow.	Date of Birth.	Date of last Calf.	No. of Days in Milk.	Date of last Service	Milk Yield in 24 hours.	Butter Yield.	Ratio, viz. lb. milk to lb. Butter	No. of Points for Butter.	No. of Points for Lactation.	No. of Points for Service.	No. of Points for Quality of Butter	Total No. of Points.	Awards and Remarks
1805	James W. McCallum	Highsteads Viscountess	May 1, 1929	April 2	88	June 24	39 0	1 13¾	20·97	29·75	4·80	Nil	8·00	42·55	H.C. and E.J.C.S., Cert. of Merit.
1806	James W. McCallum	Pearcelands Eileen 10th	July 2, 1931	Mar. 29	92	June 17	59 12	2 12½	21·48	44·50	5·20	Nil	8·00	57·70	Fifth Prize.
1807	Gordon McWilliam	Bollhayes Conceit's Leda	May 6, 1932	April 25	65	—	48 0	1 14¼	25·39	30·25	2·50	Nil	8·00	40·75	——
1808	Gordon McWilliam	Bollhayes Maid's Beauty	April 14, 1930	Feb. 24	126	May 19	37 4	1 7	25·91	23·00	8·60	·10	8·00	39·70	Insufficient points.
1809	W. H. Morgan	Zellina's Witch	Aug. 28, 1931	Mar. 25	96	—	39 0	1 3	32·84	19·00	5·60	Nil	7·00	31·60	Ratio over 30.
1819	Ovaltine Dairy Farm	Sunray of Oaklands	Oct. 12, 1930	April 25	65	—	53 12	1 13¾	28·91	29·75	2·50	Nil	7·00	39·25	Insufficient points.
1820	H. Leyborne Popham	Hunstrete Empress Doreen	Sept. 8, 1929	April 17	73	—	49 12	2 3	22·74	35·00	3·30	Nil	9·00	47·30	H.C. and E.J.C.S., Cert. of Merit.
1831	William A. White	Hunstanton Alexandra	Sept. 5, 1931	June 5	24	—	52 8	1 12½	29·47	28·50	Nil	Nil	8·00	36·50	——
		Jersey. Twice milked.													
1801	Mrs. Henry Hawkins	Gold Bell	Nov. 9, 1931	Mar. 16	105	June 5	37 4	1 11½	21·67	27·50	6·50	Nil	7·00	41·00	H.C. and E.J.C.S., Cert. of Merit.
1810	H. S. Mountain	Sir Laurence's Beauty Sleep	May 30, 1928	Jan. 25	156	May 16	47 0	1 11	27·85	27·00	11·60	·40	8·00	47·00	H.C. and E.J.C.S., Cert. of Merit.
1822	William E. Press	Diamond Buckle	May 14, 1932	May 12	48	—	36 12	1 9¼	23·29	25·25	·80	Nil	8·00	34·05	Insufficient points.
1823	The Ladies Constance Ryder and Audrey Anson	Maid o' the Moor	Sept. 15, 1931	Mar. 16	105	May 31	36 4	2 5¼	15·57	37·25	6·50	Nil	9·00	52·75	Reserve & E.J.C.S., Cert. of Merit.
1824	Mrs. Hayes Sadler	Charlton Abbotts Oxford's Velveteen 3rd	June 17, 1932	Mar. 7	114	June 3	31 0	1 4	24·80	20·00	7·40	Nil	8·00	35·40	Insufficient points.
		Kerry. Thrice milked.													
1899	Lt.-Col. J. A. Innes, D.S.O.	Ard Caein Doe	Dec. 28, 1930	May 31	29	- -	53 8	1 15	27·61	31·00	Nil	Nil	7·00	38·00	Insufficient points.
1900	Kerry Cow Dairy Farms	Drumgaunagh Eliza	Feb. 28, 1927	May 24	36	—	45 0	1 10¾	26·92	26·75	Nil	Nil	8·00	34·75	Insufficient points.

CLASS 248.—COWS OF ANY BREED OTHER THAN THOSE MENTIONED IN CLASS 247.

		Devon. Thrice milked.													
896	G. E. Braddick.	Heazle Ida 6th	June 24, 1927	May 30	30	—	52 4	1 13¾	28·10	29·75	Nil	Nil	9·00	38·75	Insufficient points.
		Dairy Shorthorn. Thrice milked.													
1132	J. Pierpont Morgan	Aldenham Miss Darlington	Oct. 18, 1928	Mar. 27	94	—	55 8	0 14	63·43	14·00	5·40	Nil	3·00	22·40	Ratio over 30.
1136	Robert N. Tory	Bladen Kirklevington	Oct. 27, 1927	Mar. 28	93	May 30	65 8	1 7¼	45·08	23·25	5·30	Nil	7·00	35·55	Ratio over 30.
1168	G. H. Willis	Millbeck Benedict's Lucy 2nd	Feb. 16, 1931	May 22	38	—	64 0	2 0¾	31·27	32·75	Nil	Nil	6·00	38·75	Ratio over 30.
		Lincolnshire Red Shorthorn. Thrice milked.													
1233	Frank Sainsbury	Scothern Sensation 4th	July 23, 1929	June 2	27	—	69 0	1 6¼	49·62	22·25	Nil	Nil	7·00	29·25	Ratio over 30.
1236	John Evens & Son	Burton Ruby Spot 32nd	Sept. 21, 1931	Feb. 22	128	—	52 4	1 9¾	32·47	25·75	8·80	Nil	8·00	42·55	Ratio over 30.
1237	Frank Sainsbury	Wratting Milker 2nd	July 31, 1931	June 7	22	—	72 12	1 4¾	56·10	20·75	Nil	Nil	3·00	23·75	Ratio over 30.
1240	Russell Wood	Bendish Cherry 37th	Sept. 9, 1930	May 23	37	—	65 0	1 13½	35·25	29·50	Nil	Nil	8·00	37·50	Ratio over 30.
1241	John Evens & Son	Burton Red Rose 10th	Jan. 8, 1932	May 17	43	—	65 8	2 1¾	31·05	33·75	·30	Nil	9·00	43·05	Ratio over 30.
		Red Poll. Thrice milked.													
1341	Sir Woodman Burbidge, Bart.	Knepp Primula 3rd	April 20, 1930	June 15	14	—	41 12	1 6	30·36	22·00	Nil	Nil	5·00	27·00	Ratio over 30.
1359	The Hon. Clive Pearson	Parham Dido	Oct. 18, 1930	May 6	54	—	53 8	1 1½	48·91	17·50	1·40	Nil	3·00	21·90	Ratio over 30.
1373	N. A. Heywood	Glevering Siskin	Sept. 21, 1931	April 14	76	May 28	78 12	1 15¼	40·31	31·25	3·60	Nil	5·00	39·85	Ratio over 30.
1377	Mrs. G. Meinertzhagen	Morston Girl 21st	June 4, 1931	May 13	47	—	62 12	1 6	45·64	22·00	·70	Nil	6·00	28·70	Ratio over 30.
		Blue Albion. Twice milked.													
1421	W. E. Glover	Mount Crocus 3rd	Aug. 11, 1929	June 7	22	—	48 12	2 2	22·94	34·00	Nil	Nil	10·00	44·00	First Prize.
		British Friesian. Thrice milked.													
1487	W. Curtis & Son	Ingatestone Myrtle Dewdrop	Feb. 26, 1927	May 21	39	—	84 12	2 2	39·88	34·00	Nil	Nil	7·00	41·00	Ratio over 30.
1491	Mrs. P. Tory	Holyport Arline	Oct. 2, 1928	June 15	14	—	69 8	2 3	31·77	35·00	Nil	Nil	7·00	42·00	Ratio over 30.
1492	Mrs. P. Tory	Penshurst Rosemary	Mar. 3, 1927	May 27	33	—	86 12	2 2	40·82	34·00	Nil	Nil	8·00	42·00	Ratio over 30.
1494	F. J. Carter	Bowerchalke Sweet Rose	Oct. 12, 1931	April 26	64	—	77 8	2 0¼	38·45	32·25	2·40	Nil	4·00	38·65	Ratio over 30.
1495	W. Curtis & Son	Abingworth Graceful	Oct. 11, 1931	April 5	85	—	88 4	2 11	32·84	43·00	4·50	Nil	9·00	56·50	Ratio over 30.
1504	James Kilpatrick	Craigiemains Lady Ada	Jan. 16, 1931	May 26	34	—	96 4	2 8¼	38·26	40·25	Nil	Nil	7·00	47·25	Ratio over 30.
1510	Strutt & Parker (Farms), Ltd.	Lavenham Beechnut 3rd	Aug. 6, 1931	June 5	24	—	70 12	1 8¾	45·74	24·75	Nil	Nil	5·00	29·75	Ratio over 30.
		Ayrshire. Thrice milked.													
1563	Alexander Cochrane	Drumfork Babs	Aug. 16, 1929	—	16	—	50 8	1 13¼	27·62	29·25	Nil	Nil	8·00	37·25	Insufficient points.

TABLE VII.—MILK YIELD CLASSES FOR GOATS AT BRISTOL, 1936.

CLASS 259.—QUALITY.

No. in Catalogue.	Exhibitor.	Name of Goat.	Breed.	Date of Birth.	Date of last Kid.	No. of days in Milk.	Milk Yield.			Percentage of Fat.		Points.						Awards and Remarks.
							Morn.	Even.	Total.	Morn.	Even.	Milk.	Fat.	Lactation.	Total.	Deduction.	Net Total.	
							Lb. oz.	Lb. oz.	Lb. oz.									
1954	Miss E. Skidmore	Heddon Buttercup	Saanen	Mar. 4, 1932	Mar. 4, 1936	119	3 10	2 12	6 6	4·10	4·00	6·37	5·16	1·10	12·63	—	12·63	—
1955	Miss C. Chamberlain	Whynot of Westons	British Saanen	April 26, 1934	Mar. 11, 1936	112	6 1	6 1	12 2	3·30	3·60	12·12	8·33	1·10	21·55	—	21·55	High Commendation
1957	J. R. Egerton	Malpas Magna	British Saanen	April 17, 1931	Mar. 6, 1935	483	5 0	4 12	9 12	3·65	3·20	9·75	6·68	3·60	20·03	—	20·03	High Commendation
1958	Edward T. Harding	Francesca	British Saanen	Mar. 26, 1934	April 3, 1936	89	5 9	5 4	10 13	3·70	4·00	10·81	8·32	0·80	19·93	—	19·93	—
1959	Edward T. Harding	Heddon Springtide	British Saanen	May 19, 1931	April 2, 1936	90	4 13	4 8	9 5	4·10	4·10	9·31	7·63	0·90	17·84	—	17·84	—
1960	Miss M. Window Harrison	Hartye of Weald	British Saanen	April 30, 1933	Mar. 3, 1936	120	8 11	8 1	16 12	3·45	3·30	16·75	11·31	1·20	29·26	—	29·26	Second Prize Chamberlain Cup Reserve Dual Purpose Challenge Certificate
1962	Mrs. Morcom	Cornish Unwise	British Saanen	Mar. 4, 1934	May 2, 1936	60	5 2	4 2	9 4	3·25	3·35	9·25	6·11	0·60	15·96	—	15·96	—
1963	Mrs. Morcom	Cornish Urchinette	British Saanen	Mar. 18, 1934	April 10, 1936	82	4 9	3 7	8 0	4·10	3·70	8·00	6·24	0·80	15·04	—	—	—
1964	Miss Pope	Heddon Slipper	British Saanen	April 13, 1930	Feb. 27, 1936	125	7 12	7 3	14 15	4·25	4·35	14·93	12·84	1·20	28·97	—	28·97	Third Prize Dual Purpose Challenge Certificate
1965	Miss E. Skidmore	Heddon Sandal	British Saanen	April 6, 1932	Mar. 6, 1936	117	6 5	2 8	8 13	3·90	3·60	8·81	6·61	1·10	16·52	—	16·52	—
1967	Miss E. Skidmore	Heddon Sorceress	British Saanen	Mar. 19, 1934	Mar. 14, 1936	109	4 6	4 0	8 6	3·95	3·90	8·37	6·57	1·00	15·94	—	15·94	—
1969	Miss V. Walton	April Moonstone	British Saanen	April 30, 1933	Mar. 27, 1936	96	5 11	5 6	11 1	3·00	3·60	11·06	7·30	0·90	19·26	—	19·26	Reserve Chamberlain Cup
1971	Mrs. Arthur Abbey	Didgemere Darkaline	British Alpine	Feb. 19, 1932	Feb. 18, 1936	134	7 10	5 11	13 5	3·75	2·90	13·31	8·85	1·30	23·46	1·00	22·46	Disqualified Abbey Cup
1972	Mrs. Arthur Abbey	Didgemere Delicious	British Alpine	April 12, 1934	April 9, 1936	83	7 5	6 2	13 7	3·20	3·30	13·43	8·73	0·80	22·96	—	22·96	—
1973	Mrs. Arthur Abbey	Didgemere Dessica	British Alpine	Mar. 11, 1934	April 25, 1936	67	7 13	6 2	13 15	4·20	3·90	13·93	11·28	0·60	25·81	—	25·81	Fifth Prize
1974	Mrs. Arthur Abbey	Didgemere Dreamy	British Alpine	Feb. 22, 1933	Mar. 21, 1935	468	5 9	4 6	9 15	3·90	3·95	9·93	7·80	3·60	21·33	—	21·33	High Commendation Reserve Abbey Cup
1975	J. R. Egerton	Didgemere Darkalette	British Alpine	Mar. 25, 1934	Mar. 18, 1936	105	5 7	4 10	10 1	4·80	4·35	10·06	9·21	1·00	20·27	—	20·27	High Commendation
1976	Miss A. B. Flower	Bordeaux Maretta	British Alpine	April 22, 1934	Feb. 28, 1936	124	5 15	5 10	11 9	3·40	3·20	11·56	7·63	1·20	20·39	—	20·39	High Commendation
1977	Mrs. Morcom	Cornish Pitch	British Alpine	Feb. 18, 1933	Mar. 27, 1935	462	4 9	3 9	8 2	3·70	3·90	8·12	6·17	3·60	17·89	—	17·89	—
1979	J. R. Egerton	Malpas Merry	Anglo Nubian	Feb. 4, 1934	April 7, 1936	85	5 12	5 2	10 14	4·80	4·40	10·87	10·00	0·80	21·67	—	21·67	High Commendation Pomeroy Cup
1980	J. R. Egerton	Malpas Mimoya	Anglo Nubian	Jan. 30, 1934	Mar. 16, 1936	107	3 12	3 3	6 15	5·20	5·10	6·93	7·14	1·00	15·07	—	15·07	—
1981	Miss K. Pelly	Ardoch Alackaday	Anglo Nubian	April 5, 1933	May 24, 1936	38	4 12	4 4	9 0	3·50	3·70	9·00	6·48	0·30	15·78	—	15·78	Reserve Pomeroy Cup
1983	Miss E. Skidmore	Moorhen	Anglo Nubian	Mar. 19, 1934	May 9, 1936	53	2 9	2 6	4 15	4·55	4·25	4·93	4·33	0·50	9·76	—	9·76	Disqualified
1985	Mrs. B. A. Browell	Bitterne Festive	British	Feb. 13, 1935	April 19, 1936	73	5 0	4 12	9 12	3·60	3·65	9·75	7·07	0·70	17·52	—	17·52	—
1987	Miss Gresley Hall	Webb Demeter	British Toggenburg	Mar. 19, 1933	Mar. 3, 1936	120	8 9	7 7	16 0	3·10	3·30	16·00	10·24	1·20	27·44	—	27·44	Fourth Prize Reserve for Dewar Cup with No. 2004
1989	Miss Gresley Hall	Webb Lettice	British	Mar. 18, 1934	April 1, 1936	91	5 13	5 10	11 7	4·20	4·20	11·43	9·60	0·90	21·93	—	21·93	High Commendation.
1990	Mrs. Morcom	Cornish Plaudit	British Toggenburg	Feb. 28, 1932	Mar. 5, 1935	484	6 10	5 2	11 12	3·80	3·70	11·75	8·81	3·60	24·16	—	—	Reserve Dewar Cup with No. 2018
1992	Mrs. Morcom	Cornish Saccharine	British	Feb. 22, 1931	Jan. 29, 1936	154	9 9	7 6	16·15	4·30	4·05	16·93	14·14	1·50	32·57	—	—	First Prize

CLASS 260.—QUANTITY.

No. in Cata-logue.	Exhibitor.	Name of Goat.	Breed.	Date of Birth.	Date of last Kid.	No. of days in Milk.	Milk Yield.			Points.						Awards and Remarks.
							Morn.	Even.	Total.	Milk.	Fat.	Lacta-tion.	Total.	De-duc-tion.	Net Total.	
							Lb. oz.	Lb. oz.	Lb. oz.							
1954	Miss E. Skidmore . .	Heddon Buttercup . .	Saanen	Mar. 4, 1932	Mar. 4, 1936	119	3 10	2 12	6 6	6·37	—	1·10	—	—	7·47	—
1955	Miss C. Chamberlain .	Whynot of Westons . .	British Saanen . .	April 26, 1934	Mar. 11, 1936	112	6 1	6 1	12 2	12·12	—	1·10	—	—	13·22	Commendation
1957	J. R. Egerton . . .	Malpas Magna . . .	British Saanen . .	April 17, 1931	Mar. 6, 1935	483	5 0	4 12	9 12	9·75	—	3·60	—	—	13·35	Commendation
1958	Edward T. Harding .	Francesca	British Saanen . .	Mar. 26, 1934	April 3, 1936	89	5 9	5 4	10 13	10·81	—	0·80	—	—	11·61	—
1959	Edward T. Harding .	Heddon Springtide . .	British Saanen . .	May 19, 1931	April 2, 1936	90	4 13	4 8	9 5	9·31	—	0·90	—	—	10·21	—
1960	Miss M. Window Harrison	Hartye of Weald . .	British Saanen . .	April 30, 1933	Mar. 3, 1936	120	8 11	8 1	16 12	16·75	—	1·20	—	—	17·95	Second Prize
1961	Miss M. Window Harrison	Haste of Weald . . .	British Saanen . .	Mar. 15, 1931	April 12, 1936	80	7 13	7 0	14 13	14·81	—	0·80	—	—	15·61	Reserve
1962	Mrs. Morcom . . .	Cornish Unwise . . .	British Saanen . .	Mar. 4, 1934	May 2, 1936	60	5 2	4 2	9 4	9·25	—	0·60	—	—	9·85	—
1963	Mrs. Morcom . . .	Cornish Urchinette . .	British Saanen . .	Mar. 18, 1934	April 10, 1936	82	4 9	3 7	8 0	8·00	—	0·80	—	—	8·80	—
1964	Miss Pope	Heddon Slipper . . .	British Saanen . .	April 13, 1930	Feb. 27, 1936	125	7 12	7 3	14 15	14·93	—	1·20	—	—	16·13	Fourth Prize
1965	Miss E. Skidmore . .	Heddon Sandal . . .	British Saanen . .	April 6, 1932	Mar. 6, 1936	117	6 5	2 8	8 13	8·81	—	1·10	—	—	9·91	—
1967	Miss E. Skidmore .	Heddon Sorceress . .	British Saanen . .	Mar. 19, 1934	Mar. 14, 1936	109	4 6	4 0	8 6	8·37	—	1·00	—	—	9·37	—
1969	Miss V. Walton . .	April Moonstone . . .	British Saanen . .	April 30, 1933	Mar. 27, 1936	96	5 11	5 6	11 1	11·06	—	0·90	—	—	11·96	—
1971	Mrs. Arthur Abbey .	Didgemere Darkaline .	British Alpine . . .	Feb. 19, 1932	Feb. 18, 1936	134	7 10	5 11	13 5	13·31	—	1·30	—	—	14·61	High Commendation
1972	Mrs. Arthur Abbey .	Didgemere Delicious .	British Alpine . . .	April 12, 1934	April 9, 1936	83	7 5	6 2	13 7	13·43	—	0·80	—	—	14·23	High Commendation
1973	Mrs. Arthur Abbey .	Didgemere Dessica . .	British Alpine . . .	Mar. 11, 1934	April 25, 1936	67	7 13	6 2	13 15	13·93	—	0·60	—	—	14·53	High Commendation
1974	Mrs. Arthur Abbey .	Didgemere Dreamy . .	British Alpine . . .	Feb. 22, 1933	Mar. 21, 1935	468	5 9	4 6	9 15	9·93	—	3·60	—	—	13·53	Commendation
1975	J. R. Egerton . . .	Didgemere Darkalette .	British Alpine . . .	Mar. 25, 1934	Mar. 18, 1936	105	5 7	4 10	10 1	10·06	—	1·00	—	—	11·06	—
1976	Miss A. B. Flower .	Bordeaux Maretta . .	British Alpine . . .	April 22, 1934	Feb. 28, 1936	124	5 15	5 10	11 9	11·56	—	1·20	—	—	12·76	Commendation
1977	Mrs. Morcom . . .	Cornish Pitch . . .	British Alpine . . .	Feb. 18, 1933	Mar. 27, 1935	462	4 9	3 9	8 2	8·12	—	3·60	—	—	11·72	—
1978	J. R. Egerton . .	Malpas Merilees . . .	Anglo Nubian . .	Feb. 16, 1932	April 18, 1936	74	5 12	5 2	10 14	10·87	—	0·70	—	—	11·57	—
1979	J. R. Egerton . .	Malpas Merry. . . .	Anglo Nubian . . .	Feb. 4, 1934	April 7, 1936	85	3 12	3 3	6 15	6·93	—	0·80	—	—	7·73	—
1983	Miss E. Skidmore . .	Moorhen	Anglo Nubian . . .	Mar. 19, 1934	May 9, 1936	53	2 9	2 6	4 15	4·93	—	0·50	—	—	5·43	Disqualified
1985	Mrs. B. A. Browell .	Bitterns Festive . . .	British	Feb. 13, 1935	April 19, 1936	73	5 0	4 12	9 12	9·75	—	0·70	—	—	10·45	—
1987	Miss Gresley Hall . .	Webb Demeter . . .	British Toggenburg .	Mar. 19, 1933	Mar. 3, 1936	120	8 9	7 7	16 0	16·00	—	1·20	—	—	17·20	Third Prize
1989	Miss Gresley Hall . .	Webb Lettice . . .	British	Mar. 18, 1934	April 1, 1936	91	5 13	5 10	11 7	11·43	—	0·90	—	—	12·33	Commendation
1990	Mrs. Morcom . . .	Cornish Plaudit . . .	British Toggenburg .	Feb. 28, 1932	Mar. 5, 1935	484	6 10	5 2	11 12	11·75	—	3·60	—	—	15·35	High Commendation
1991	Mrs. Morcom . . .	Cornish Playful . . .	British	Feb. 21, 1933	April 11, 1936	81	8 2	7 3	15 5	15·31	—	0·80	—	—	16·11	Fifth Prize
1992	Mrs. Morcom . . .	Cornish Saccharine . .	British	Feb. 22, 1931	Jan. 29, 1936	154	9 9	7 6	16 15	16·93	—	1·50	—	—	18·43	First Prize

MILK YIELD TRIALS.

CLASSES 259 AND 260.—*Goats.*

Mr. T. W. Palmer was as usual in charge of this section. The results of the Trials are given in Table VII.

THE WORKING DAIRY.

The work carried out in the working dairy was similar to that obtaining at previous shows. This consisted of receiving and paying for all milk produced on the show-ground; the separating of the same, and the conversion of the cream obtained into butter and cream cheese: the carrying out of the Milk Yield Trial and Butter Tests, and the conducting of the Butter-making Competitions.

To cope with all these various activities, the staff was fully occupied during the period of the show, and I wish to express my appreciation of the loyal assistance rendered by all concerned.

The total entries for the butter-making competitions numbered 111, and in order to complete the work of judging the same during the days on which the show was held, as many as 30 competitors had to appear in one class. The judges in charge of the competition expressed their satisfaction with the work done.

A great deal of interest was evinced by the public in these competitions, especially that of the Inter-County Championship, which was won by the Cornwall team, the Devonshire and Worcester teams being second and third respectively.

In the individual championship competition, the winner was Miss Olga Eustice, of Hayle, Cornwall, Mrs. Mogford, of South Molton, being the reserve.

I wish to place on record the able assistance which Mr. E. H. Walters rendered in the Poultry Section.

RICHARD H. EVANS.

Barclays Bank Chambers,
Pwllheli,
North Wales.

THE FORESTRY EXHIBITION TO THE BRISTOL SHOW, 1936.

THE preparation made and forethought given to the arrangements for the Forestry Exhibits of the 1936 Royal Show were, as one has been led to expect in previous years, the last word in Show-yard management.

The increased interest that is being taken in Forestry, both by those who have made a lifelong study of the subject and by the general public, who in recent years have made their weight felt when it comes to deciding how and what land shall be planted, leads one to think that this is a section which must surely go on growing in size and usefulness.

The general public should be grateful to those landowners who support the Forestry Section, very often at a good deal of expense and inconvenience to themselves. Besides being a great attraction it is undoubtedly an education to those who are able to see the timber converted from trees which are to be seen growing in the parks and pleasure grounds now open to the public; and it is to be hoped that the public, now that it realizes the many uses and the great charm of many of our home timbers, will make its influence felt by an increased demand for native-grown produce. Timber will be required in quantity and variety in connection with the Coronation in 1937, and it would surely be appropriate that British-grown timber should be put to such a use.

COMPETITIVE CLASSES.

CLASS I. for *Specimens of Oak, Elm, Ash, Spanish Chestnut, Sycamore,* and *Beech Timber or any of their varieties* grown in Great Britain.

There were five entries in this Class, and a remarkably good lot of planks was staged. The first prize and silver medal went to Mr. H. A. Benyon, Englefield Estate, Reading, for planks of oak, ash, elm, Spanish chestnut, sycamore and beech. The oak plank, of great width and superb quality, taken from a tree 153 years old with saleable contents of 398 cubic feet, grown on a loam soil, must have made many foresters and timber merchants break the Tenth Commandment, for a more beautiful bit of oak can seldom have been seen. Foresters should note that the tree from which this plank was taken was grown in a mixed plantation.

The beech, elm and sycamore planks belonging to the same owner were also of very fine quality.

Second prize and bronze medal went to The Berkeley Estates Company for oak, wych-elm, ash, sycamore and beech planks, of which the outstanding item was undoubtedly the wych-elm, taken from a tree eighty years old with a saleable content of 209 cubic feet. Not a few of us would like to know how to grow a wych-elm of this size and quality with a butt up to 18 feet to the first branch.

Some fine quality planks from the Badminton Estates Company followed closely behind, and the exhibits from Earl Bathurst and the Hon. Mrs. Smyth, although from smaller trees, were of beautiful quality.

CLASS II, for *Specimens of Larch, Silver Fir, Douglas, Spruce* and *Pine Timber*, brought six entries.

First prize and silver medal went to The Badminton Estates Company with an exhibit of larch, silver fir, Norway spruce and Scotch fir. The larch plank was particularly fine, taken from a tree 116 years old with saleable contents 134 cubic feet and a butt length of 35 feet to first branch, grown at an altitude of 410 feet on a Brash soil over oolite, on a southern aspect. One could not help thinking that, had this tree been cut at an earlier date, the saleable cubic contents would have been very much greater.

The second prize, bronze medal, went to Mr. H. A. Benyon for a very good collection.

CLASS X, for *Forest Transplants* and *Seedlings, Ornamental* and *Specimen Trees*, of which not more than two examples of each type may be exhibited, the class being confined to Trade Nurseries, produced no entry.

Having regard to the utmost importance of obtaining good forest transplants and seedlings, it was disappointing to find no exhibits from some of the well known Trade Nurseries within easy reach of Bristol. One hopes that this class will not be allowed to die out through lack of support, for apart from the interest of an exhibit of this nature, it must surely be a good advertisement for those firms who send exhibits.

The writer was asked by more than one member of the Society to demonstrate what constitutes a good transplant, but with no example staged there was nothing to demonstrate with.

In the section for exhibits not for competition there were some of exceptional merit, and all of them may be considered good and of interest to the objects of the exhibition. The difficulty of the judge was rather how to limit his awards. The Royal Agricultural College, Cirencester, put up a remarkable exhibit which received the special silver gilt medal for the best collection inside and outside the Pavilion. It occupied some 470 square feet inside the Pavilion, and embraced everything to do with Forestry and its enemies, among which the rabbit, which was there in person, would seem, and rightly so, to take first place. A good example was shown of the miniature pine partridge screens or belts common round Newmarket, illustrating how the density can be increased by mountain pine to form a screen for the guns.

Another example showed how, by strategic planting of small new coverts, a pheasant shoot can be improved and how, by the right choice of shrubs, new and existing coverts may be made to hold game.

There were also some good specimens of model field gates, with criticisms, of pruned and unpruned poles in section, of various types of pruning saws and examples of their work, and of planting methods on peat, heather and light sands.

Perhaps the most instructive part of this very comprehensive exhibit was that showing mistakes made, when dealing with dying elms, through confusing the damage due to elm disease with that caused by the beetle, or drought, or Elm Fungus.

Outside the Pavilion twenty-four poles from the College forest garden, being average poles from each plot after thirty-two years' growth were shown, 14 feet butt lengths being planted in the ground. These illustrated the knowledge to be gained from sample plots.

Another silver medal was won by The Research Station, Bristol University, which put up a very good and interesting exhibit of bat willow in all its stages. Outside the Pavilion specimen standard trees of bat willow were shown.

Mr. H. Benyon staged a marvellous display of block flooring in oak, walnut and sycamore, a larch panel door, a walnut overmantel, a sideboard in oak and larch, of very fine craftsmanship, for which he won a silver medal.

A bronze medal went to Mr. Anthony Tavener's exhibit, which constituted a good illustration of the many uses to which home-grown timber can be put. A swivel-back chair with seat, arms and back of elm was pleasing to look at, and at the same time most comfortable and up to any weight. Amongst other exhibits Mr. Tavener had a plank of fine quality of the brown oak of which we hear so much and see so little.

Another bronze medal was won by Messrs. Mould & Bloomer, who exhibited a model of woodlands with a working plan showing how, with a little ingenuity, it is possible to combine forestry and game preservation (so long as the ground game is kept down) without sacrificing one for the other. It must surely have given food for thought to those woodland owners who are living under the false impression that to neglect their woodlands is the most profitable course to pursue.

Another interesting exhibit amongst many more was that of the Hon. Mrs. Smyth, who showed some very fine elm and larch doors, also yew and holly plank.

One must not pass without mentioning the useful and attractive displays put up by the Royal English Forestry Society, who showed a good collection of elm and ash chairs, elm strip flooring, Douglas and Corsican larch plank, and a specimen of Douglas pruning.

The Chartered Surveyors Institute showed, amongst other very interesting and instructive items, specimens of beech and its various uses and a half-round section of a Pollard beech 316 years old, blown in 1928.

The Land Agents Society's exhibit was that of the life of the ash from birth to death. The British Wood Preserving Association showed examples of Norway spruce, Scots pine and elm creosoted under pressure, and of alder and beech creosoted in the open tank, while the Berkeley Estate put up an exhibit showing the ravages of Dutch elm disease and damage by mistletoe.

WALTER BARTON.

JUDGE'S REPORT ON GATES, TREE GUARDS AND FENCING, BRISTOL SHOW, 1936.

CLASS III. *Oak Field Gate for Farm Use.*

A very fair entry and a good standard of work. First prize was awarded to Mr. H. A. Benyon (No. 13). Second prize to the Berkeley Estates Company (No. 14). Both these gates were well made, the fitting and assembling showing excellent workmanship, tight, well braced, and true-hung in first class order. I noticed, in two cases, packing had been inserted to make up mortices in the heel. This is very inadvisable, as the packing will always fall out and cause the gate to drop, thereby making it very difficult to open or close, especially for anyone on horseback. It also allows the wet to get in, thus shortening the life of the gate. The oak generally was of excellent quality and with ordinary attention should last a lifetime.

CLASS IV. *Combination Gates.*

Also a fair entry. Several of these gates stood out in the quality of the timber, work, and finish. The first prize was awarded to Mr. H. A. Benyon (No. 20) for a well made gate, excellently fitting and square. The second prize was awarded to the Tortworth Estate Company (No. 24), whose exhibit came very near to the level of workmanship, etc., of the first prize winner. Several of the others reached almost the same standard of excellence. I was some time in arriving at a decision in this class owing to the good work generally. The iron work on two of these gates appeared rather heavy and not conducive to good and easy handling. Top bars should be chamfered a little on top to get rid of water. The heads and backs should also be rounded on the face sides. Experience proves that the life of gates is considerably shortened by wet continually lodging in the morticing.

CLASS V. *Cleft Gates.*

There were only two entries in this section. This is regrettable, as the cleft gate is a good proposition for inland work, being less expensive to produce. I awarded first prize to Mr. C. P. Ackers (No. 25) as being the best fitted and, for a cleft gate, well hung.

CLASS VI. *Hunting Gates.*

A good class with some excellent gates, both in oak and larch. The Tortworth Estate Company (No. 34) was awarded first prize for a well made and balanced gate, thoroughly braced and well hung. Mr. H. A. Benyon (No. 30) was awarded second, his exhibit being well made, square and very well hung. It was almost equal to the first. Other gates in this class were very good, coming nearly up to the standard of prizes and deserving special mention. Both the oak and larch in this class were of good quality.

CLASS VII. *Tree Guards.*

There were only three entries in this class. The first prize was awarded to the Berkeley Estates Company (No. 36) for a good substantial guard—strong, and providing easy access for pruning and safety from cattle. Second prize was awarded to Mr. H. A. Benyon (No. 35)—a fair second, his entry being well made and safe.

CLASS VIII. *Field Fencing.*

First prize was awarded to Mr. H. A. Benyon (No. 39) for a good serviceable fence, well made and strong, of a fair height and easy to erect and repair. Second prize was awarded to the Berkeley Estates Company (No. 41) for a good strong and well made fence.

CLASS IX. *Park or Ornamental Fence.*

First prize was awarded to Mr. C. P. Ackers (No. 42) for a good design of this type of fence, well made, of fair height and strong. Second prize was awarded to Mr. H. A. Benyon (No. 44) for what was also a good durable fence.

J. R. JACKSON.

GATE MAKING COMPETITION.

THERE were only three entries in this practical section. Messrs. T. Matthews and V. Roffe of the Huntley Manor Estate (No. 2) were awarded first prize. Time—3 hours 8 minutes. The work was good, the mortices were clean and finished off fair and square. Messrs. Leslie Charles Price and W. Gardner of the Ashton Court Estate (No. 1) were awarded second. Time—3 hours 15 minutes. This gate was finished square although the bars were somewhat out of alignment. The mortice holes were very fair. Messrs. W. J. Pullin and G. Barter of the Longleaf Estate Company (No. 3) came third. Time —4 hours 25 minutes. Fair work was done in the assembling of this gate but the great difference in the time taken caused me to place it third. The timber for these gates was of a uniform quality and quite fair to each entrant. It is a matter for regret that there was not more competition in this section, as gate making is a very important part of forestry work and is deserving of much more interest from an estate point of view. I hope better entries will be secured for the 1937 show.

J. R. JACKSON.

REPORT ON THE WOODLANDS, PLANTATIONS, AND ESTATE NURSERIES COMPETITION, 1936.

THE competition this year was open to estates in the counties of Herefordshire, Gloucestershire, Somersetshire, and Wiltshire. There were forty-seven entries from nine estates as compared with forty-seven entries from eleven estates last year in the north of England.

As might be expected from the comparative situations of the areas concerned, the hardwood classes were much better filled than was the case in 1935, for the entries came from the Cotswold beech woods and the rich-soiled woodlands of the south-west, as opposed to the exposed, moor-edge plantations, often at high altitudes, of the north. But there was, too, keen competition in the softwood classes and, though there were in these less than half the number of last year's entries, the standard, particularly in the case of Japanese larch, was very high.

The class for coppice or coppice-with-standards was disappointing as regards the number of entries, of which there were only three. This is the more to be regretted as the winning stand in the class was of exceptional merit and interest, and was in fact one of the best areas of coppice-with-standards that the judges had seen in any part of the country. Generally speaking, however, the coppice on the various estates visited was of indifferent quality, and it would appear that the market for underwood has lapsed in this part of the country, although the intensive and profitable utilization of coppice on the Huntley Manor estate suggests that this form of forest produce has, under keen management, a promising future.

Individual entries of merit are described under their respective classes. It may, however, not be out of place at this point to draw attention to six entries which, in the opinion of the judges, were of outstanding interest. These were: Kingscote Wood (beech), belonging to F. E. Workman, Esq., Class I (*b*); Parkhill (Sitka spruce), belonging to Sir Henry Hoare, Bart., Class II (*a*); Deerwood Common (Japanese larch), belonging to The Duke of Somerset, Class II (*a*); Old Hill (European larch), belonging to Viscountess Monsell, Class II (*b*); Big Wood (natural regeneration of ash), belonging to Viscountess Monsell (Class V); The Huntley Manor estate, belonging to C. P. Ackers, Esq. (Class VII).

ASH.—On the majority of the estates the soil and site quality were eminently suited to the growth of first quality ash, and many fine stands of this species were seen. In those places where the quality and rate of growth were poor it was invariably found that the land had either not been drained at all, or that the drains had been allowed to become blocked. The contrast (sometimes to be seen in different parts of the same wood) between stands of ash on drained and undrained land was indeed very striking, and suggested that the necessity for draining, even on sites which are not apparently damp, is not always sufficiently recognized. The effect was to be seen, not only in the improved quality and growth of the crop, but also in the much more successful natural regeneration; for whereas in drained areas there was an abundance of plants of every size from seedlings to poles, on undrained areas the self-sown plants seemed unable to survive for more than two or three years, and if they did survive were stunted and ill-shaped.

CULTURAL TREATMENT on the majority of estates was good. The standard of thinning was above the average, the excellence of the thinning of European and Japanese larch plantations being particularly noticeable.

Stands of Japanese larch of first quality growth were seen on seven of the nine estates visited and, in view of the ready market available, it would seem that this is the most profitable softwood species that can be grown in the district, it's rate of growth and production of clean timber comparing very favourably with those of the Douglas fir plantations which are being planted so extensively on most of the estates concerned.

The Schedule of the competition comprises the following classes :—

I. Where it is intended that hardwoods shall form the final crop.

(*a*) Planted from 10–25 years.
(*b*) More than 25 years of age.

II. Where it is intended that any of the following conifers shall form the final crop, viz.: Douglas fir, Sitka spruce, Norway spruce, Japanese larch, European larch, Corsican pine, Scots pine.

(*a*) Planted from 10–20 years.
(*b*) More than 20 years of age.

III. Where the intention is to have a mixed final crop of conifers and hardwoods.

(*a*) Planted from 10–20 years.
(*b*) More than 20 years of age.

IV. Plantations of any conifer not specified in Class II.

V. Coppice or coppice-with-standards.

VI. The best-managed estate nurseries.

VII. The best-managed woodlands on an estate of not less than 1,000 acres.

CLASS I (*a*). *Young Hardwoods.* The silver medal was awarded to C. P. Ackers, Esq., Huntley Manor, Gloucester, for *Big Beech Fall, Newent Wood.* This twenty-four-years-old plantation is constituted of chestnut and European larch, the latter being removed in the course of thinning operations. The chestnut, which are being high-pruned, are approximately 35 feet in height and average 5¼ inches Q.G.

The bronze medal was awarded to The Viscountess Monsell, C.B.E., Dumbleton Hall, Evesham, for *Hearle's Hill,* a twenty-three-year-old plantation, constituted of ash and elm. The measurements of the ash were: height, 35 feet; girth, 5 inches Q.G. Elm: height, 35 feet; girth, 6 inches Q.G. Some individuals of both species were forked at a height of 15–20 feet.

CLASS I (*b*). *Hardwoods more than 25 years old.* The silver medal was awarded to F. E. Workman, Esq., Rosare, Woodchester, Stroud, for *Kingscote Wood,* a 40-acre stand of beech. Situated on the steep sides of a valley, on loam overlying oolitic limestone, this magnificent stand also received the gold medal for the best plantation entered in the competition. It can have few rivals in any part of the country. The average height of the trees is 100 feet (individuals measured 112 feet), the mean timber-height is 80 feet, and the girth at breast height ranges from 13¾ inches to 25 inches Q.G., with an average of 15 inches. There are approximately fifty trees to the acre, and the judges rough-estimated the volume per acre to be 5,000 cubic feet. The boles are of perfect shape with little taper, and are, almost without exception, clear of branches for the first 80 feet. During recent years poor, badly-shaped, and competing trees have been removed, and, although this constituted only a very light thinning, it is evident that the existing crop has benefited considerably thereby. Altogether, this is a stand which cannot readily be forgotten.

The bronze medal also went to F. E. Workman, Esq., for *Blackstable,* a 30-acre stand of mature beech, situated on a steep hill-side facing north, on heavy loam overlying oolitic limestone. The mean timber height is 65–70 feet, and the mean quarter girth at breast height 13 inches. The area is fully stocked, and has been thinned at proper intervals. (It may be mentioned that all the beech stands on this estate are of first quality, and are receiving most careful cultural treatment).

Class II (*a*). *Young Softwoods.* The silver medal was awarded to Sir Henry Hoare, Bart., Stourhead, Wilts, for *Parkhead,* a seventeen-years-old Sitka spruce plantation, 4·2 acres in extent, growing on heavy loam at an elevation of 750 feet, the previous crop having been European larch of poor quality. The trees were notch-planted 6 feet apart, and have never been thinned. Few individuals have become suppressed, and there are probably at the present time some 1,500 trees per acre. The remarkable quality and growth of this stand is evidenced by measurements, which show the average tree to have a height of 46 feet, and a girth at breast height of 5 inches Q.G. The stand is very uniform, and there are few individuals less than 40 feet in height or 4½ inches Q.G.

The bronze medal was awarded to His Grace The Duke of Somerset, Maiden Bradley, Frome, Somerset, for *Deerwood Common,* a nine-years-old Japanese larch plantation, situated on greensand, at an elevation of 800 feet. Both from the financial and the silvicultural point of view, this plantation is worthy of note, for when thinned in 1935 (at eight years) the net profit per annum was £6, and the present measurements of the average tree are: height, 26 feet; girth, 3 inches Q.G. (the dominants being considerably larger).

Class II (*b*). *Softwoods more than twenty years old.* The silver medal was awarded to Viscountess Monsell for *Old Hill,* a forty-four-years-old plantation of pure European larch, growing on heavy loam at an elevation of approximately 800 feet. This beautiful plantation is notable in that, while it carries for the species an exceptionally heavy crop (350 trees to the acre), the health of the trees is in every way excellent, the crowns are thriving, the rate of growth—in girth as well as height—is rapid, and the quality of the timber is first class. The trees at present average 85 feet in height and girth 8½ inches Q.G. at breast height—though many individuals exceed 90 feet in height and have a girth of 12 inches. Past returns are not ascertainable, it being only known that the stand was fairly heavily thinned during the war. Altogether this is one of the finest stands of European larch that the writers have seen, and it may be added that it was a close runner-up for the gold medal.

The bronze medal was awarded to Viscountess Monsell for *Ryefurlong,* a thirty-years-old Japanese larch plantation, 5 acres in extent, situated at an elevation of 450–500 feet. It has been thinned three times, the last occasion being in 1934, and though there are indications that the earlier thinnings were somewhat delayed, the present spacing of the crop is perfect. The height of the average tree is 70 feet, and the girth at breast height is 6½ inches Q.G.

CLASS III (*a*). *Mixed Hardwoods and Softwoods, less than twenty years old.* The silver medal was awarded to C. P. Ackers, Esq., for *Woodgate Plantation,* a nineteen-years-old stand of larch, Douglas, oak, ash, and beech.

No bronze medal was awarded in this class.

CLASS III (*b*). *Mixed Hardwoods and Softwoods, more than twenty years old.* The silver medal was awarded to C. P. Ackers, Esq., for *No. 3 fall, Newent Wood*; a twenty-two-years-old plantation of larch and chestnut. The height of both species was 34–40 feet; the larch girthed 5½ inches Q.G., the chestnut 4 inches. The canopy, general health, and spacing of the trees were very good.

The bronze medal was awarded to Viscountess Monsell for *Townhill,* a twenty-seven-years-old plantation of European larch, chestnut, and other hardwoods.

CLASS IV. *Open to any Conifer other than those eligible for Class II.* The silver medal was awarded to C. P. Ackers, Esq., for *Grandis Plot on Huntley Hill.* This one-acre stand of *Abies Grandis,* with European larch as nurses, is seven years old. The crop is in every way thriving, the height growth is good, and altogether this is a promising young plantation.

The bronze medal was awarded to The Rt. Hon. Earl Bathurst, C.M.G., Cirencester Park, Cirencester, for *The Thuja Covert,* a twenty-years-old plantation of Thuja and European larch, in which both species are thriving, though the larch are making considerably the greater height growth.

CLASS V. *Coppice or coppice-with-standards.* The silver medal was awarded to Viscountess Monsell for *Big Wood,* an area 58 acres in extent. Thirty years ago this wood consisted of a few old oak and ash standards over worn-out coppice of little value. Those responsible for the management of the woodlands decided to replace this unprofitable crop with ash highwood over ash coppice. Their aim has been achieved with complete success, and almost entirely by means of natural regeneration. The wood is now fully stocked with first quality ash coppice (for which there is a ready local market), and there are some forty-five standards to the acre having an average timber height of 28 feet, and an average girth at breast height of 6 inches Q.G. The ground is thickly carpeted with seedlings and young plants; and this is, in fact, a very fine example of: (*a*) successful natural regeneration; (*b*) successful growth of good quality ash; and (*c*) far-sighted policy of management, perseveringly carried out, with a resultant complete success.

The bronze medal was awarded to Viscountess Monsell for *Perret's Hill*, a 5-acre stand, twenty-one years old, of chestnut coppice under ash standards.

Class VI. *Estate Nurseries.* The silver medal was awarded to C. P. Ackers, Esq. His extensive nurseries are more fully dealt with under Class VII. It is sufficient to say here that the quality and growth of seedlings and transplants, the condition of the ground, and the general nursery management are alike of a high standard.

Class VII. *For the best-managed Woodlands on an estate of not less than* 1,000 *acres.* This class, the most interesting to judge, and perhaps the most difficult also, serves the most useful purpose, for under it owners are able to ask for advice and criticism regarding their forest policy, and to obtain suggestions as to the future development of their woods. As an example of the value of this service may be cited an estate the woodlands on which were entered for competition about ten years ago. The judges of that year advised the owner that his woodland area, which was then under inferior and unprofitable coppice, was capable of growing first quality ash. The owner acted upon this advice with the result that the judges of this year, instead of wading through a depressing tangle of worthless undergrowth, were able to view with pleasure a series of thriving young ash plantations, well tended and needing no criticism.

The silver-gilt medal for the best managed woodland was awarded to C. P. Ackers, Esq., Huntley Manor, Gloucester. The woodlands, 1,482 acres in extent, are of immense interest, both to the forester as demonstrating the successful conversion (over a period of twenty-five years) of unprofitable, over-cut woodland into intensely productive commercial woodland; and to the rural economist because of the very large amount of employment which is provided, directly and indirectly, by the development of the woods. Intensive development and utilization is, indeed, the keynote of this estate, and the judges were impressed by the manner in which every form of woodland produce was marketed at a profit.

About half the woodland area is contained in one block, Newent Wood, and, from the silvicultural point of view, this may be taken as typical of the whole. Twenty-five years ago Newent Wood consisted of a severely robbed area of oak standards over coppice, having been heavily cut over for many years in the endeavour to hold together a bankrupt estate. It was then purchased by Mr. Ackers. Now it is constituted of fully stocked plantations, ranging in age from one to twenty-five years, and producing a steadily increasing annual return.

A noticeable and unusual feature of the young plantations is the dense growth of coppice which is allowed to remain in competition with the young trees until it has attained marketable size. A cursory examination suggests that the trees might be likely to suffer from this association, but in fact such is not the case, as was seen by the excellent condition of all those plantations from which the coppice, having attained marketable size, had been cleared. Since a ready market has been developed for the coppice this system is obviously desirable, for not only does it provide the raw material for some of the many conversion industries run by the estate, but it also obviates the first unprofitable thinning or cleaning on which money would ordinarily have to be expended.

The soil on which this wood is situated changes from light May Hill grit (Wenlock series) at 800 feet elevation to heavy red marl at 250 feet. Chestnut and European larch are the main species on the lighter soils; oak, ash, Douglas fir, and larch on the medium soils; with Japanese larch predominating on the cold, heavier marl. High pruning is carried out with bill-hooks to a height of 35 feet.

Christmas trees are grown extensively, the present stock planted out being between one and one and a half million. During the past three years sales have averaged approximately 150,000 trees a year, providing seasonal employment for twenty men and boys in the planting season, and double this number in the lifting season.

Cricket bat willows are being tried out. They are planted, not, as is usually the case, along the banks of streams, but in " orchard formation " with trenches running between the rows, by means of which the crop is irrigated when necessary. None of the trees has yet attained marketable dimensions, but some individuals measured by the judges girthed 5 inches Q.G. at breast height at an age of three years.

The nursery, covering some 18 acres, has developed from an estate nursery into a commercial undertaking, having an output of some 250,000 forest tree plants every year, not including the Christmas tree stock, quickthorn for hedging, and Thuja for hedge plants. Besides forest trees, a large number of ornamental, rare, and exotic trees and shrubs are grown. These vary from cuttings worth 10*s.* per 100 to standards and shrubs worth from 7*s.* 6*d.* to several pounds apiece. No estimate of the quantity can be given, but the retail value is about £10,000. This nursery has been brought into existence during the last ten years. The plants, especially the conifers, are of high quality, and the general condition and cleanliness of the nursery are very good.

Conversion and utilization have here been more highly developed than on any other estate that the writers have visited. It was only five years ago that the cleaving of ash underwood was developed, from cleft hurdles only, to include pick and axe handles and tent pegs. Already nearly one million tent pegs have been sold in a season, but this industry has to suffer very heavy competition from sawn beech pegs coming largely from the district between High Wycombe and Henley, as well as from large imports from Czechoslovakia.

The large estate sawmill utilizes chiefly oak, about 50,000 cubic feet of this timber being used every year. One of the main objects of development on the Huntley Manor Estate has been to supplement rather than compete with local established industries; and since many old-established firms in the neighbourhood produce really good ordinary sawmill goods and turnery goods, the oak is largely cleft into gate rails, ladder rungs, feather-edged pales, and roofing shingles. Cleaving is further developed in utilizing locally grown chestnut and Douglas for pale fencing which was previously available only from the Kent and Sussex areas. It is for this reason, too, that fruit trees are not propagated in the nursery, that no turnery department has been established, and that the making of wattle hurdles (another new industry for the district) is encouraged instead of the more easy sale of pea and bean sticks.

In addition to the sawmill the following industries are in operation :—

Industry.	Timber used.	Number employed (Mostly wholetime).
Cleft pale fencing	Chestnut, Douglas, Thuja	9
Wattle hurdles	Hazel and some oak	3
Cleft hurdles	Ash	1
,, handles	,,	4
,, tent pegs	,,	13
Other cleft goods	Oak	3
Besom making	Birch and lime	1
Rustic poles and general undergrowth	——	16
Cricket bat willow	——	2

The numbers of men employed in the woods and dependent activities are as follows :—

Woods	47
Sawmill	21
Other industries	29
Nurseries	20
Total (on the Huntley Manor Estate alone)	117

These figures (1,482 acres of woodland + 5 acres of nursery, providing employment for 117 men) need no comment.

The above notes give a bare description of the woodland activities at Huntley. It is not possible in a report such as the present one to deal adequately with this remarkable estate, whose owner appears to have solved for himself those problems of marketing which are the chief problem of most owners of forests.

The silver medal was awarded to Viscountess Monsell for the *Dumbleton Hall Estate* near Evesham. These woodlands, 236 acres in extent, form a perfect example of good forestry practised in harmonious conjunction with the other interests and amenities of the estate. Dumbleton is one of the famous pheasant shoots of the south of England, and the plantations are laid out and treated with great regard to their properties as covert, but this has not at all interfered with their merits from the point of view of forestry. The choice of species has been wise; all the plantations are well thinned and well tended; and the silvicultural methods adopted have proved very successful. The fact that this estate was awarded silver medals in Class II (*b*) and Class V, and bronze medals in Classes I (*a*), II (*b*), III (*b*), and V sufficiently demonstrates the high standard of the individual plantations, and is a considerable achievement when the modest acreage of the woodlands is taken into consideration. The fact that such successful forestry marches hand in hand with such successful covert-shooting deserves special emphasis, and might be noted with profit to themselves by many landowners in every part of the country.

Individual plantations on this estate have already been fully described under the different classes for which they obtained awards, so that little more need be said here. Attention must again be drawn, however, to Big Wood, the naturally regenerating area of ash standards and ash coppice which gained the silver medal in Class V. The judges saw many woods on other estates which were of the same potential character as Big Wood, but even in those cases where natural regeneration had been, or was being, attempted there was little evidence of success. The reason that Big Wood has succeeded where others have failed lies, in our opinion, in the fact that the area is systematically drained, *and that the drains are regularly cleaned.* To this must be added the infinite care and wise forestry that have obviously been expended on this wood (and, indeed, the whole woodland area) during the past thirty years.

The bronze medal was awarded to F. E. Workman, Esq., for the woodlands, 781 acres in extent, on the Ebworth Park and Kingscote Estate. The problems and the merits of this estate are in almost every respect dissimilar from those met with at Huntley and Dumbleton. At Huntley the problem which the owner originally encountered was the clearance of old, poor-quality stands; and the achievement for which the owner merits special praise is his development of markets and industries.

At Dumbleton the problem was the development of good forestry without detriment to the sporting interests; and the achievement lies in the complete success with which the objective has been attained, the fine stands of timber which have been grown, and the successful accomplishment of a scheme of natural regeneration.

Mr. Workman's problems and achievements differ from either of the above. His woodlands, when they came into his possession some years ago, consisted principally of pure beech stands, 100 years old and upwards; a great part of them were remote from roads, and where roads did exist they were for the most part badly engineered—at any rate, so far as the extraction of timber is concerned. Mr. Workman is building an extensive system of roads which will, when completed, convert an area of woodland—at present unprofitable because of its inaccessibility—into an economically profitable undertaking. It is hardly necessary to point out that such work is formidable and costly, but the fact that it will open up nearly 800 acres of ideal forest land is evidence of the wisdom of this far-sighted policy. In the meantime a sound forest working policy is being pursued. Areas are cleared and replanted as and when possible, the area replanted annually over the last ten years averaging 14 acres.

The stands of beech on this estate are exceptional. The two finest areas have already been described under Class I (*b*), but some hundreds of acres besides carry crops which are comparable to these. There can, indeed, be few estates which could show such a uniformly high-quality crop over the whole woodland area. In almost every compartment the ground is fully and evenly stocked; the height growth seldom falls below 80 feet; the length of clean bole ranges from 40–80 feet; and all the trees are well shaped. The judges were struck with the wise and moderate thinnings which are being carried out, and to which the trees are obviously responding.

NIGEL A. ORDE-POWLETT.
P. S. BARNIE.

ERRATA.

It is regretted that, through an inadvertence, the Bronze Medal in Class VII. is reported as having been awarded to F. E. Workman, Esq. In point of fact this medal was awarded to The Duke of Somerset for his extremely interesting and well managed woodlands at Maiden Bradley, Mr. Workman's woodlands coming fourth in order of merit in this class.

N. A. ORDE-POWLETT.

REPORT OF THE COUNCIL TO THE ANNUAL GENERAL MEETING OF GOVERNORS AND MEMBERS OF THE SOCIETY,

HELD AT

16, BEDFORD SQUARE, LONDON, W.C.,

On WEDNESDAY, December 9, 1936, *at* 3 *p.m.*

All Governors and Members join with their fellow citizens throughout the Country and the whole of the British Empire in mourning for the death of His Majesty King George the Fifth, who during his long connection with the Royal Agricultural Society, beginning in the year 1892, never failed to give it his help and encouragement on any and every possible occasion.

At their meeting on February 5th the Council passed loyal and dutiful Addresses of Condolence with His Majesty King Edward the Eighth and with Her Majesty Queen Mary. Gracious acknowledgments of these Addresses were later received by the Society from the Secretary of State for the Home Department.

His Majesty King Edward has shown a close personal interest in the Society, having been one of its Trustees for seventeen years, and in 1920 its President. Since his accession His Majesty has conferred upon the Society a mark of his Royal favour by becoming its Patron.

Membership.

The list of Governors and Members has undergone the following changes since the Annual General Meeting on December 11, 1935: 14 new Governors (including 4 transferred from the list of Members under Bye-law 9) and 576 new Members have joined the Society, and 1 Governor and 6 Members have been reinstated under Bye-law 14; whilst the deaths of 7 Life Governors, 7 Governors, 84 Life Members, 169 Members and 2 Honorary Members have been reported. 8 Life Members and 13 Members have been struck off the books under Bye-law 12, owing to absence of addresses; 106 Members under Bye-law 13, for arrears of subscription; 2 Governors and 240 Annual Members have resigned.

A number of Members who have paid fifty annual subscriptions have, under the provision in Bye-law 4, been transferred to the list of Life Members during the year.

Losses by death include four of the Society's Council—the Earl of Yarborough, K.G., Mr. R. B. Neilson, Captain H. G. Buxton, and Mr. E. Craig Tanner.

Lord Yarborough joined the Society in 1880 and became a Governor in 1906. In the following year, when the annual show was held at Lincoln, he filled the Presidential Chair. On the termination of his year of office he was elected a Vice-President and continued in that capacity until his death.

Mr. Neilson was elected to the Council in 1922 as a representative of Cheshire. He was a most active member of the Chemical, Stock Prizes, Judges Selection, and Showyard Works Committees, and from their meetings he was seldom absent. In connection with the Society's Shows at Chester in 1925 and at Manchester in 1930 he rendered services which were invaluable.

Captain Buxton met his death shortly after the Council meeting on July 29th, at which he was present. He was elected to the Council as a representative of the Division of Norfolk in 1929, and did useful service as a member of the Veterinary, Stock Prizes, Judges Selection, Implement and Research Committees.

Mr. Craig Tanner first became associated with the Society in 1914; in 1921 he was elected a Governor, and two years later he joined the Council as a representative of the Division of Shropshire. He served on the Stock Prizes and Veterinary Committees, and he also did duty as a Steward of Stock at the Society's Shows.

The Council also have to record the passing of Mr. Arthur Hiscock, who represented the County of Dorset on the Council from 1905 until 1931; of Lord Strachie, who represented Somerset from 1912 to 1934; and of Sir Arnold Theiler, who, in 1934, was awarded the Society's Gold Medal and Honorary Membership for distinguished services to Agriculture.

Mention was made in the last Report of the resignation of Mr. Thomas Brown, the Society's Clerk of Works, who had served the Society for fifty-seven years. It was with regret that the Council learned of Mr. Brown's death at the end of March last.

In October the death occurred, after a long illness, of Mr. Peter Blair, who had been Manager of the Horticultural section of the Society's Show since 1910.

Amongst other Governors and Members whose loss by death the Society has to deplore are the Earl of Dartmouth, G.C.V.O., K.C.B., Viscountess St. Cyres, Lord Banbury, Lord Deramore, Sir James Hill, Bt., Colonel Sir P. S. Marling, Bt., V.C., C.B., Sir Lionel Phillips, Bt., Sir Herbert Sharp, Bt., Brig.-Gen. Sir R. B. Colvin, K.C.B., Sir H. Trustram Eve, K.B.E., Sir John M. Frost, Major-Gen. the Hon. Sir Newton Moore, K.C.M.G., Sir F. A. Newdigate-Newdegate, G.C.M.G., Sir Lindsay Parkinson, Mr. F. N. Blundell, Mr. Amos Chippendale, Major Coningsby Disraeli, Mr. G. R. C. Foster, Mr. W. Gaymer, Mr. F. V. Gooch, Mr. R. Neville Grenville, Mr. J. W. Kenworthy, Mr. John Measures, Mr. Alfred Palmer, D.Sc., Major W. H. Rawnsley, Lieut.-Col. Walter W. Wiggin and Mr. E. S. Wilmot-Sitwell.

Honorary Life Governors.

In recognition of their services to Agriculture, Sir Percy Vincent, Bt. (late Lord Mayor of London), and Mr. Walter Elliot, M.P. (late Minister of Agriculture), have been elected Honorary Life Governors.

Numbers on Register.

These and other changes bring the total number of Governors and Members on the Register to 9,024, divided as follows :—

141 Life Governors ;
197 Annual Governors ;
1,591 Life Members ;
7,078 Annual Members ;
17 Honorary Members.

9,024 Total numbers of Governors and Members, as against a total of 9,068 on the Register at the time of the last Annual Report.

Membership Committee.

Early in the year a Committee was appointed to enquire into the reduction in the Membership. In an interim report the following proposals were made by the Committee ; these were approved by the Council, and effect was given to them at the Bristol Show :—

That the privileges of *Governors* be increased as follows :—

(1) Governors should in future be granted a Lady's Badge entitling the holder to the full privileges of the Annual Show, Flower Show, Members' Pavilion, Council and Governors' Luncheon Room, etc.

(2) The provision of a special box in the reserved portion of the Grand Stand in which a Governor and a Lady wearing their badges would have free seats.

(3) Free admission to a Special Car Park reserved for the cars of Governors.

With regard to the ordinary Members, the Council realized the inconvenience it is to Members not to be able to introduce Ladies into the Members' Pavilion, and, to remedy this, it was decided that Members should be given a Voucher which would, on presentation, admit to the Pavilion a Lady who had already paid for admission to the Showyard.

Presidency.

The Council have decided to recommend to the Annual General Meeting the election of Mr. U. Roland Burke as President of the Society to hold office until the Annual Meeting in 1937.

Changes in the Council.

Sir Merrik Burrell, Bt., has been elected a Trustee, Sir George L. Courthope and Mr. John Evens have been appointed Vice-Presidents, Mr. Richard H. Evans has become a "nominated member" of Council, Mr. Albert Weightman has been elected as the Member for Durham, Sir Ian Walker has been elected for Derbyshire, and Captain Ralph Aldersey has been elected for Cheshire.

Elections to the Council.

Members of Council retiring under the scheme of rotation at the forthcoming Annual Meeting are those representing the electoral districts of Group C, comprising Berkshire, Cambridgeshire, Cumberland, Glamorgan, Gloucestershire, Huntingdonshire, Kent, Lincolnshire, Oxfordshire, Somerset, Sussex, Warwickshire, Westmorland, Yorkshire—East Riding, Ireland and North Wales. Governors and Members registered in those districts have been communicated with, and the usual procedure is being followed for the election or re-election of representatives for the Divisions concerned.

Dates of Council Meetings in 1937.

The Council have fixed the following dates for their meetings in 1937: February 3, March 3, April 7, May 5, June 2, July 7 (in Wolverhampton showyard), July 28, November 3, December 8.

Accounts.

In compliance with the bye-laws, the Council beg formally to submit the balance-sheet with receipts and payments for the year 1935. These accounts were circulated to Governors and Members in June last, having been certified as correct by the Professional Accountants and Auditors.

Copies of these accounts, and also the Statement of Receipts and Expenditure of the Show held this year at Bristol, will be available for reference at the meeting on December 9.

Bristol Show.

The 95th Annual Show was held in Ashton Park, Bristol, on a site placed at the disposal of the Society by the Hon. Mrs. Smyth. It was the fourth occasion on which the Show had been held in this City of the West, others being in 1842, 1878 and 1913. The site, although perhaps not so central as Durdham Downs, was an excellent one and provided a most picturesque setting for the Show.

A Local Committee, with the Lord Mayor of Bristol as Chairman, worked most energetically to raise the requisite local fund and afforded not only every assistance but extended a very hearty welcome to the Show.

The President, Sir Merrik Burrell, Bt., was present each day and did not spare himself in helping with the organization or in offering a welcome and hospitality to visitors to the Show.

The Show was visited on Wednesday by Their Royal Highnesses the Duke and Duchess of York, who arrived during a heavy downpour of rain, but in spite of that they inspected the local branch of the British Legion at the Main Entrance before proceeding to the Royal Pavilion to be accorded an enthusiastic welcome by the President, Members of Council and visitors to the Exhibition.

The weather during the five days of the Show was most unfavourable. It rained each day except Saturday, and although it made it distinctly unpleasant for everyone yet the various events were carried through without exception. Judging on the Tuesday was completed in good time and the time-table of the Ring attractions was varied only by a few minutes, in spite of the torrential rain.

In addition to the visit of Their Royal Highnesses the Duke and Duchess of York, the Lord Mayor of London, Sheriffs and Officers of the City Corporation honoured the Show with their presence on Friday, the 3rd July. This was made the occasion of a civic reception and State visit to the Show.

At the General Meeting of Governors and Members in the Showyard, presided over by Sir Merrik Burrell, votes of thanks were accorded the Lord Mayor of Bristol, Mr. T. R. Davey (the Hon. Treasurer), the Town Clerk and others who had worked so hard to promote the success of the Show.

New Implements.

Two Silver Medals were awarded by the Judges for New Implements exhibited at the Bristol Show, viz., Allis-Chalmers Manufacturing Co., London, for their All Crop Harvester, and A. C. Bamlett, Ltd., Thirsk, for their One Horse Motor-driven Mower.

On the recommendation of the Judges, the Grass Drying Plant, entered by Sir Bernard E. Greenwell, Bt., has been deferred until next year.

Young Farmers' International Judging Contest.

The International Dairy Cattle Judging Contest, decided at Bristol on the Wednesday of the Show, was the fifteenth annual event of its kind. America, Northern Ireland, England, Scotland and Wales were represented, and competition for the Gold Cup was keener than ever. In the final result, England were again first, the U.S.A. second, Scotland third, Wales fourth, and Northern Ireland fifth.

Young Farmers' Stock.

On the third day of the Show there was an exhibition of beef and dairy stock from the Young Farmers' Clubs in the Counties of Devon, Gloucester, Somerset, and Wiltshire. Entries numbered 132 in this section, no fewer than fifty being in one class. In the afternoon the President of the Society addressed the Young Farmers outside the Royal Pavilion, and made the presentation of the Gold Cup and other awards in the International Judging Contest. Later, the Young Farmers from the four countries paraded with their stock in the large Ring, the procession being headed by the International teams bearing their national flags.

Woodlands, Plantations and Estate Nurseries.

This year's competition covered the counties of Gloucester, Wiltshire, Hereford, and Worcester. There were thirty-nine plantations, one nursery and six estates entered. Mr. F. E. Workman, of Woodchester, Stroud, gained the Royal English Forestry Society's Gold Medal for the best plantation, and the Silver Gilt Medal for the best-managed woodlands on an estate of not less than 1,000 acres was awarded to Mr. Charles P. Ackers, of Huntley Manor, Gloucester.

In 1937 the Woodlands, Plantations, and Estate Nurseries Competition will be confined to the counties of Leicester, Warwick, Rutland, and Northampton.

Wolverhampton Show.

From Tuesday, July 6th, to Saturday, July 10th, 1937, the 96th annual exhibition of the Society will be held at Wolverhampton on a site in Wrottesley Park kindly provided by Lord Wrottesley. The Staffordshire Agricultural Society have agreed not to hold their County Show next year, and an arrangement has been made whereby their members will receive privileges similar to those to be enjoyed by members of "the Royal."

Prize Sheet.

The Prize Sheet will be issued in the New Year. The Council have voted £10,000 towards the Prizes and, in addition, offers of Champions, Challenge Cups and Class Prizes have been received from the following Breed Societies:—Shire Horse Society, Clydesdale Horse Society, Suffolk Horse Society, British Percheron Horse Society, Hunters' Improvement and National Light Horse Breeding Society, National Pony Society, Arab Horse Society, Shetland Pony Stud Book Society, Shorthorn Society, Hereford Herd Book Society, Devon Cattle Breeders' Society, Sussex Herd Book Society, Sussex Cattle Breeders' Society of South Africa, Welsh Black Cattle Society, Longhorn Cattle Society, Aberdeen-Angus Cattle Society, English Aberdeen-Angus Cattle Association, Dun and Belted Galloway Cattle Breeders' Association, Galloway Cattle Society, Lincolnshire Red Shorthorn Association, South Devon Herd Book Society, Red Poll Cattle Society, Blue Albion Cattle Society, British Friesian Cattle Society, Ayrshire Cattle Herd Book Society, English Guernsey Cattle Society, English Jersey Cattle Society, British Kerry Cattle Society, Dexter Cattle Society, British Goat Society, Oxford Down Sheep Breeders' Association, Shropshire Sheep Breeders' Association, Southdown Sheep Society, Hampshire Down Sheep Breeder's Association, Suffolk Sheep Society, Dorset Down Sheep Breeders' Association, Dorset Horn Sheep Breeders' Association, Wiltshire Horn Sheep Society, Ryeland Flock Book Society, Kerry Hill (Wales) Flock Book Society, Clun Forest Sheep Breeders' Association, Lincoln Longwool Sheep Breeders' Association, Leicester Sheep Breeders' Association, Society of Border Leicester Sheep Breeders, Wensleydale Longwool Sheep Breeders' Association, Kent or Romney Marsh Sheep Breeders' Association, Welsh Mountain Sheep Flock Book Society, Black Welsh Mountain Sheep Breeders' Association, National Pig Breeders' Association, Large Black Pig Society, Gloucestershire Old Spots Pig Society, Cumberland Pig Breeders' Association, Essex Pig Society, National Long White Lop-eared Pig Society, National Welsh Pig Society.

Special Prizes are being offered in the Poultry section by the Croad Langshan Club, Sussex Poultry Club, Buff Orpington Club, British Black Barnevelder Club, Welsummer Club, Rhode Island Red Club, Plymouth Rock Society, Buff Plymouth Rock Club.

Closing of Entries.

Intending exhibitors at Wolverhampton are reminded that the final date for receiving entries of Live Stock is MAY 8th. Entries for Produce close on MAY 19th, and entries for Poultry, Eggs, and Butter-making Competitions on MAY 29th.

Applications for space in the Implement, etc., Department must be made not later than March 20th.

Show Dates.

As the outcome of correspondence with the Highland and Agricultural Society of Scotland and representations by the Agricultural Engineers' Association, special consideration has been given to the question of dates for future Shows. The Council have now decided that, as a general rule, the Royal Agricultural Society's Show should in future years begin on the first Tuesday in July.

It is hoped that this arrangement will be the means of ensuring at least one week's interval between the Shows of the two National Societies and meet the convenience of those exhibitors who are regularly represented at both events.

Future Shows.

In 1938, as already announced, Cardiff will be the venue of the Society's Show.

The year 1939, being the Society's Centenary, His Majesty the King has graciously signified his approval of the Show that year being held in Windsor Great Park, the scene of the Society's Jubilee Show in 1889.

Argentine Rural Society.

Following what has become an established custom, the Council again, at the request of the Argentine Rural Society, appointed Judges to officiate at the Show held at Palermo last September. This year the panel was made up as follows :—

Shorthorns.—Mr. James Durno, Crichie, Inverurie.

Aberdeen Angus Cattle, Hampshire Down and Oxford Down Sheep.—Mr. W. J. Reid, Fordhouse of Dun, Montrose.

Hereford Cattle.—W. H. Jones, Brook Farm, Lyonshall.

Agricultural Tractors.

At the time of the last Annual Report the Council were considering the desirability of organizing trials of Tractors. Serious objections having been put forward by the Society of Motor Manufacturers & Traders, the Council decided not to proceed with the project. In the view of the Society's Consulting Engineer, Mr. S. J. Wright, however, a real need exists for accurate test information regarding many new tractors introduced since the trials of 1930, and in his opinion the necessary test information could be provided without in any way conflicting with the objections raised by the trade interests.

A memorandum by Mr. Wright outlining his proposals was approved in principle by the Implement Committee of the Council and these proposals were discussed at a meeting of representatives of the Society, the Ministry of Agriculture, the Institute for Research in Agricultural Engineering, the Society of Motor Manufacturers & Traders, the Agricultural Engineers'

Association and the Tractor Users' Association. Subsequently, a conference of representatives of the Society with representatives of the tractor manufacturers and distributors was held to consider a scheme of tests. In view of the recommendations then arrived at, the Council decided to constitute a Control Committee to consist of Colonel Stanyforth and/or Mr. Bell, and Captain H. G. Buxton, as representing the R.A.S.E., two representatives of the Society of Motor Manufacturers & Traders (one a Maker and one an Importer); two representatives of the Agricultural Engineers' Association (one a Maker and one an Importer); two representatives of the Tractor Users' Association; and two representatives of the Machinery Testing Committee of the Ministry of Agriculture and Fisheries; with the Society's Consulting Engineer as Technical Adviser.

Delegates have now been appointed by the different bodies to be represented on the Control Committee, and their first meeting was held in October.

Awards to Farm Workers.

Since the last Annual Meeting, Medals and Certificates for long service have been awarded to farm workers as under :—

Years Service.	
62.	William Lee, Great Everden, Daventry.
61.	Robert Edwin Foot, Little Langford, Salisbury.
56.	Thomas Matthews, Little Langford, Salisbury.
55.	William Henry Noyce, Little Langford, Salisbury.
51.	Walter Peake, Ermine House Farm, Appleby, Scunthorpe, Lincs.
51.	Harry Robbins, Wolferton, King's Lynn, Norfolk.
50.	Eliza Postans, The Rhyse, Tenbury Wells, Worcs.
47.	George Barnard, Church Lane, Appleby, Scunthorpe, Lincs.
46.	Alfred Noyce, Little Langford, Salisbury.
45.	George Smith, Wishford, Salisbury.
44.	David Curl, Steeple Langford, Salisbury.
44.	John Dowdell, Little Langford, Salisbury.
43.	Henry Reynolds, The Poultry House, Kyrewood, Tenbury, Worcs.
42.	George Ashley, Heath Brook, Hodnet, Shropshire.
42.	Bertram Noyce, Little Langford, Salisbury.
41.	George Mead, High Street, Stewkley, Leighton Buzzard.
40.	William Chadney, Kyrewood, Tenbury, Worcs.

Service qualifying for a Medal is forty years on the same or different holdings with one employer, or forty years on the same holding with different employers. Farm workers (male or female)—excluding gardeners, grooms and gamekeepers—in any part of England or Wales, are eligible for the awards. Claims on behalf of farm workers must be made through County Agricultural Societies on special forms which may be obtained from the Secretary of the Royal Agricultural Society of England, at 16, Bedford Square, London, W.C.1.

Chemical Department.

The ordinary analytical and consulting work referred to the Society's Laboratory has proceeded much as in recent years. The applications for analyses amounted to 110 as against ninety-three in the previous twelve months. An exceptionally large number (forty-eight) of Ciders were additionally examined in connection with the Bristol Show.

The principal concern of the Chemical Committee, apart from the above, has been the setting-up, at the instance of the Council, of a Special Committee, consisting of representatives from the leading agricultural organizations, to consider the present working of the Fertilizers and Feeding Stuffs Act. This body has held two meetings at the Society's premises, viz., on April 28th and July 21st, Mr. Fred Smith presiding. These meetings were exceptionally well attended and have, so far, resulted in a unanimous expression as to the insufficiencies of the present Act, and the need for improving it, chiefly in respect of the provisions for obtaining formal samples on which action can subsequently be based, and for tracing samples so taken back to their original source. A further meeting will be held later on to decide on the action to be taken.

The matter of the occurrence of Castor in feeding-stuffs, mainly those of foreign production, which was largely the cause of the above enquiry, has been carefully watched, and it is satisfactory to record that, with the exception of one case in which compensation to the extent of £900 was paid, there has been little to bring to the notice of the Chemical Committee. It is to be hoped, therefore, that the energetic action of the Society's officials is having its influence on the trade and on the importers of feeding-stuffs.

A somewhat similar result appears to have followed the Society's action in the direction of maintaining the purity and right description of such materials as Wheat offals, Barley Meal, etc.

The year has seen but slight change in the supply or prices of fertilizers, the rise in potash salts having been previously noted and provided for in the Compensation Tables issued by the Central Association of Agricultural Valuers. But there has recently been a marked increase in the prices of feeding-stuffs generally, Linseed and Cotton cakes, as well as Earth-nut and Soya cakes, having gone up fully £1 or more a ton, while cereals such as Maize, Barley, Wheat offals, etc., have experienced a like rise.

The latest feature of interest has been the preparation of Dried Grass, and the examination of samples so obtained. These will be reported on in the Society's *Journal* in due course.

In the autumn there appeared, as one of the series of "Rothamsted Monographs on Agricultural Science," and under the editorship of Sir John Russell, a work entitled "Fifty Years of Experiments at the Woburn Experimental Station." This book contains a record by Dr. Voelcker of the work carried out at Woburn, first by his father and then by himself, during the period that the station was under the care of the R.A.S.E. (1876–1926), and previous to its forming, as it now does, a part of the Rothamsted Experimental Station. Together with an account of the history of the Station and a detailed record of the various experiments, contributed by Dr. Voelcker himself, there is a section by Sir John Russell dealing critically with the work and setting out the lessons to be learnt from it. To this are added sections by Mr. Cochran on the statistical bearings of the experiments, and by Dr. E. M. Crowther—both these authors being on the Rothamsted staff—on the analyses of the soils of the various plots concerned in the experiments. The book is published by Longmans, Green & Co., 39, Paternoster Row, E.C.4.; price 21*s*.

Botanical Department.

The delays in the sowing of the autumn cereals caused by the difficulties of working the land after the harvest of 1935, led in the beginning of 1936 to more enquiries than usual as to the best varieties to sow then. The conditions proved to be generally unfavourable for sowing until it was too late to risk making use of any of the autumn varieties, and a demand for spring wheats set in which was large enough to exhaust the available supplies of such well-known varieties as Red Marvel and April Bearded. It proved possible, however, to put members in touch with merchants carrying stocks of other suitable varieties.

The next substantial group of enquiries came towards the end of June and throughout July. A long spell of wet weather had made it impossible to keep the land clean and many members found weeds with which they were not familiar on their farms. There was no difficulty in identifying these but simple methods of eradication could rarely be suggested.

As the cereal harvest came on, the diseases of these crops—especially of wheat—came into prominence. The most important of these was "take-all" or "whiteheads," and it soon became evident that it was far more prevalent than usual and, moreover, that the fungus responsible for it was fruiting at an unusually early date.

Whilst these were the outstanding features of the year, the general run of enquiries continued on much the same course as in previous years and again the tendency for those of a pathological nature to outnumber all others was evident. But, in spite of the difficulties of the season, the number of enquiries has shown a marked decline.

Zoological Department.

The routine work of the Department has consisted in answering letters from members with regard to insect pests attacking farm crops and animals or infesting stored products, identifying specimens sent, and advising as to treatment. Most of the pests enquired about presented no novelty, but the most important incident was the discovery that a fly which for years past has been exceedingly destructive to asparagus on the Continent had obtained a footing in England. The Ministry of Agriculture and Fisheries was duly notified, and it is hoped that all growers are now alive to the danger of the introduction of this most formidable enemy into their asparagus beds. The matter will be dealt with in the Annual Report of the Zoologist.

Veterinary Department.

Members of the Society have, as usual, taken advantage of their privileges by consulting the Royal Veterinary College (through their local veterinary surgeons in many cases) in certain ailments of farm stock, and the College staff have freely given assistance in elucidating obscure disease problems, suggesting means either preventive or curative by which the losses have been curtailed.

There has been a continued demand for advice and laboratory help in the control of mastitis, the most common form of which (a chronic one) can be controlled by the separation of infected and non-infected cows based on the laboratory tests of their milk. This laboratory test is necessary, because the milk of many cows, which do not show obvious disease, nevertheless contains large numbers of infective organisms which may be the means of spreading, mainly during milking. The milk of all adult females should be tested. In this way it is possible to detect infected animals and prevent the spread of infection to the healthy ones. Heifers are generally free from infection.

A special service at a reduced fee has been instituted for herds in which all adult females are tested at regular intervals with a view to the control and eradication of mastitis.

Another more acute form of mastitis which has been serious in certain machine-milked herds has disappeared following alterations of the degree of vacuum, etc.

In the case of contagious abortion, eradication on the basis of the blood agglutination test is now being increasingly recognized as the best way of dealing with the disease wherever separation of infected and non-infected cows is at all possible. There is a growing and welcome tendency on the part of owners to have all breeding animals in the herd tested with a view to eradication rather than to test a few individual animals which are for some reason suspect. A blood test of all animals of breeding age is necessary, because many infected animals do not abort. These nevertheless excrete a large number of infective organisms and are serious sources of further spread. They can be detected by a blood test and preventive measures taken.

An essential point which has to be emphasized in control is the separation of reactors and non-reactors when at liberty in pastures or in yards, and the value of calving down all animals in boxes, as it is at this time that there is most risk of the spread of infection. When tied up it is worth while here to note that it is possible to keep reactors and non-reactors in the same shed without great danger of spread. Great care should be taken with newly purchased animals, which should be isolated until tested. That this eradication work is gaining popularity is evidenced by the numerous requests which reach the Research Institute.

A special service at a reduced fee has also been instituted for herds in which all breeding stock are blood-tested at regular intervals for the control and eradication of contagious abortion.

The existence in this country of a form of contagious abortion associated with an entirely different agent, a small protozoan, and characterized by early abortion (often unobserved), and the return to the male at two to four months, or by chronic metritis has been established. It is important that its occurrence should be diagnosed and its spread prevented.

A number of enquiries have been made regarding disease in young calves and a large number of carcases have reached the College for post-mortem examination.

Investigations have been made into the common diseases, including the White Scour of calves, and attempts are being made to distinguish between those races of *Bacterium coli*, which cause the disease, from those that are normally present and produce no effects.

In regard to the other farm animals, advice has been given in respect of the treatment of warbles in cattle, elimination of lice from horses, and the effects of intestinal worms in colts; whilst numerous post-mortem examinations have also been made of pigs in connection with outbreaks of infectious disease.

Contribution to Royal Veterinary College.

In response to a renewed Appeal launched at the Mansion House on October 19th, the Council, at their last meeting, decided to make a further contribution to the Royal Veterinary College of £500. A donation of the same amount was made by the Society in 1927.

Animal Diseases

Confirmed outbreaks of Anthrax and Parasitic Mange were rather more numerous during the first nine months than in the corresponding period of last year. On the other hand it is satisfactory to learn that Sheep Scab outbreaks continue to decrease, and that there was less Swine Fever. The country had a period of complete freedom from Foot and Mouth disease from the end of January till early September, but since then outbreaks have been confirmed in various counties.

Warble Fly.

Some seven years ago a Committee was formed by the Leathersellers Company, consisting of representatives of the R.A.S.E. with other agricultural bodies, county authorities, as well as of the leather trades, to investigate the problem of the warble fly pest. The Ministry of Agriculture were eventually pressed to issue an order imposing compulsory dressing of infested cattle. Due preparation having been made and difficulties as far as possible overcome, the Warble Fly (Dressing of Cattle) Order was issued by the Ministry on the 31st January last. At the same time orders of a similar character were issued by the Ministries of Northern Ireland and the Irish Free State.

Under the Great Britain Order, treatment of all visibly infested cattle is required by one of two alternative methods :

(1) with a dressing consisting of a Derris preparation at monthly intervals from March to June until the maggots disappear ; or

(2) the removal and effective destruction of all ripe maggots from the backs of infested cattle, by squeezing out or other mechanical means, at intervals not exceeding ten days during the months March to June until the maggots cease to appear.

The Council welcomed the issue of this Order, but viewed with regret the inclusion of the second alternative, and the matter was the subject of a communication to the Ministry. Subsequently, a Superintending Inspector of the Ministry discussed the question with the Society's Veterinary Committee. It was then explained that whilst the squeezing out method involved great effort where large numbers of cattle had to be treated, it was very effective and would probably be found to be most economical and convenient for treating small dairy herds where infestation was light and the cattle docile. In the circumstances, the Ministry felt that there was no justification for prohibiting the squeezing out form of treatment.

Export of British Pedigree Live Stock.

In March the Council received a letter from the Commonwealth of Australia setting out the terms and conditions upon which assistance would be given by the Commonwealth Government, Banks and Shipping Companies to importers of pedigree breeding stock. Under this arrangement buyers are able to ship to Australia at a low rate and are only called upon to pay two-fifths of the cost.

It is a matter for satisfaction that the Society's representations have produced such a satisfactory result.

The Council regret, however, that, so far, the New Zealand Government have not seen their way to allow the importation of British stock through the London Quarantine Station. Resolutions on this subject having been received from various Breed Societies, the Council, at their meeting in April, decided to address a letter to the Dominion Government urging a speedy and sympathetic reconsideration of the situation. A copy of this communication, with a covering letter, was subsequently sent to the National Farmers' Union in New Zealand, and this was later strongly supported by a letter from the National Farmers' Union of this country.

From the Dominion a reply was received in July stating that, owing to their preoccupation with major policy questions, the Government had not been able to give consideration to the matter, but the Society's representations would be borne in mind when the question was being dealt with. The President of the New Zealand Farmers' Union wrote that he, personally, was very much in favour of lifting the embargo and had constantly advocated its removal. He believed that there was a swing now towards its removal, but he was not sure that this was large enough to do anything at present.

The Live Stock Situation.

The live stock situation in the country and the Government proposals were the subject of a discussion at the Council meeting at the end of July, and it was eventually agreed to address a communication in the following terms to the Minister of Agriculture :—

> SIR,
>
> I am instructed to inform you that the Council of the Royal Agricultural Society, having considered the recent pronouncement on the levy on foreign beef and increased subsidy to home-grown beef, together with some measure of quantitative restrictions on Dominion beef, are of opinion that although these are steps in the right direction, they do not go far enough to make the rearing of store cattle of the right type, and the production of good class beef, sufficiently attractive to the farmers to induce them to revert to those forms of livelihood. For them to do so is, in the opinion of the Council, essential to the well being of the whole agricultural industry, and particularly necessary to relieve the Milk Marketing Board of the burden of the milk now coming from the former rearing and feeding districts.

It is felt that the steady deterioration both in quantity and quality of our store cattle is deplorable, and is a serious menace to the adequacy of the food supply of this country in the event of war. Hence, though grateful for what has been accomplished, the Council ventures to urge the Minister to deal further with this urgent problem.

Yours, etc.

Research Committee.

An investigation has been conducted, with the aid of grants from the Society's Research Committee, at the Animal Pathology Research Institute of the Royal Veterinary College, the main object of which has been to place on a firm footing the bacteriology of various diseases under the heading of Bovine Mastitis, in order that the most promising methods of control of the disease might be subjected to practical enquiry. The work of control of the disease, which has been in progress for several years, reached last year a stage at which it could be more profitably handled by an institution set up primarily for field research.

The grant hitherto given for Mastitis research has now been made available for an investigation concerned with Calf Diseases. A survey of the extent of mortality among young calves is being undertaken by the Research Institute of the College with financial assistance from the Agricultural Research Council. While this survey is proceeding, it is proposed to study the bacteriology of the particular diseases brought to light in the course of the work now completed, and problems of control will also be dealt with.

An interim report on the Pig Feeding Experiment undertaken for the Committee at the Cambridge University Farm was printed in the last issue of the *Journal*. The experiment has been continued, and a further report will appear in a later volume.

At Rothamsted the work concerned with the inoculation of Lucerne and other Legumes, and with the Utilization of Electric Power, has been continued.

Experiments in the Eradication of Sheep Ticks have been carried on for another season, under the auspices of the Armstrong College, and an interim report will be given in the next *Journal*.

For the Grass Seeds Mixture trials to be conducted by the Welsh Plant Breeding Station, the past year has been devoted to the growing of seed, and it is hoped that the trials will begin at a number of centres during the next season.

A second year's work on the Cumulative Effects on a light arable soil of various methods in the Disposal of Sugar Beet Tops and Straw has been done at the Norfolk Agricultural Station.

The scheme for an experiment to be carried out at the farm of the Rothamsted Experimental Station to test the results of Cake Feeding on Grass Land is now under consideration.

As usual, the annual progress report of the Committee will appear in the forthcoming volume of the *Journal.*

"The Farmer's Guide."

The Farmer's Guide to Agricultural Research in 1935 will, according to custom, again appear as part of the next *Journal.* A limited number of reprints of the *Guide* will be on sale at 2*s.* (post-free 2*s.* 3*d.*), and copies at 1*s.* will be available to the staffs and students of agricultural colleges and farm institutes through those institutions.

Queen Victoria Gifts.

For the ensuing year the Trustees of the Queen Victoria Gifts Fund made a grant of £160 to the Royal Agricultural Benevolent Institution to be allocated as six gifts of £10 each to Male Candidates, two gifts of £20 each to Married Couples, six gifts of £10 each to Female Candidates: the distribution in each class to be left until after the election to pensions by the Institution. Since the fund was raised in 1897, £6,740 has been paid over to the Institution.

Medals for Cattle Pathology.

In the annual examination for the Society's prizes held at the Royal Veterinary College, the Silver Medal was won by Mr. A. T. Phillipson, and the Bronze Medal by Mr. J. D. Blaxland. The examination was conducted by the Professors of the College and comprised written and oral work in the diseases of cattle, sheep and swine.

National Diploma in Agriculture.

At the thirty-seventh annual examination held this year at the University of Leeds from April 15th to 22nd, fifty-one candidates were awarded the National Diploma in Agriculture, two with Honours. The successful candidates were :—

Diploma with Honours.

1st. EDWARD DAWSON, University of Leeds.
2nd. WILLIAM JOHN CUMBER, Junr., West of Scotland Agricultural College, Glasgow.

Diploma.

CHARLES HENRY AITCHISON, University of Glasgow and West of Scotland Agricultural College.
ROWLAND TUDOR BATHER, South Eastern Agricultural College, Wye, Kent.
ALFRED JAMES GRIFFIN BEECHEY, Royal Agricultural College, Cirencester.
WILFRED HENRY GEORGE BLACKER, University of Reading.
HAROLD BROADBERRY, Midland Agricultural College, Sutton Bonington, Loughborough.

Stanley Culpin, East Anglian Institute of Agriculture, Chelmsford.

Roger Probert Davies, University College of Wales, Aberystwyth.

Robert Archibald Dyke, Harper Adams Agricultural College, Newport, Shropshire.

Alan Scott Gage, West of Scotland Agricultural College, Glasgow.

Leslie Hammond Heap, Harper Adams Agricultural College, Newport, Shropshire.

James William Houghton, Midland Agricultural College, Sutton Bonington.

William Johnstone, University of Glasgow & West of Scotland Agricultural College.

Kenneth Walter Kemp, East Anglian Institute of Agriculture, Chelmsford.

Ivor Ernest Ketteringham, Midland Agricultural College, Sutton Bonington.

John Richard Keyworth, Royal Agricultural College, Cirencester.

Egerton Martin Kidner, University of Reading.

Gilbert Sinclair Lawrie, Edinburgh & East of Scotland College of Agriculture.

John Lockhart, West of Scotland Agricultural College, Glasgow.

Jesse Campbell Mitchell McCall, West of Scotland Agricultural College, Glasgow.

Alastair Macdonald, Edinburgh & East of Scotland College of Agriculture.

Parlan James Macfarlan, University of Glasgow & West of Scotland Agricultural College.

James M'Gibbon, University of Glasgow & West of Scotland Agricultural College.

John Collington Matthews, Midland Agricultural College, Sutton Bonington.

Michael Francis Merchant, East Anglian Institute of Agriculture, Chelmsford.

Thomas Mitchell Mitchell, West of Scotland Agricultural College, Glasgow.

John Alfred Newrick, University of Leeds.

John O'Neill, University of Glasgow & West of Scotland Agricultural College.

George Ord, Armstrong College, Newcastle-upon-Tyne.

James Paterson, University of Glasgow & West of Scotland Agricultural College.

William Edward Richards, University of Reading.

Iorwerth Roberts, University College of Wales, Aberystwyth.

Wesley Scragg, Harper Adams Agricultural College, Newport, Shropshire.

Ernest James Scriven, Seale Hayne Agricultural College, Newton Abbot, Devon.

Alexander Morton Service, West of Scotland Agricultural College, Glasgow.

James Frederick Shaw, Midland Agricultural College, Sutton Bonington.

Geoffrey Hargreaves Smith, Armstrong College, Newcastle-upon-Tyne.

Walter Riddell Smith, Armstrong College, Newcastle-upon-Tyne.

William Buckland Smith, East Anglian Institute of Agriculture, Chelmsford.

Herbert Gerald Stableford, Midland Agricultural College, Sutton Bonington.

Norman Slade Strickland, South Eastern Agricultural College, Wye, Kent.
Ford Gibson Sturrock, West of Scotland Agricultural College, Glasgow.
Harold Temperton, Armstrong College, Newcastle-upon-Tyne.
Thomas Henry Thompson, Armstrong College, Newcastle-upon-Tyne.
Norman Turner, University of Glasgow & West of Scotland Agricultural College.
John Carswell Warnock, University of Glasgow & West of Scotland Agricultural College.
John Johnston Scott Webster, Royal Agricultural College, Cirencester.
Charles Trevor Williams, University College of Wales, Aberystwyth.
Kenneth Percival Williams, University College of Wales, Aberystwyth.
Geoffrey Williamson, Armstrong College, Newcastle-upon-Tyne.

National Diploma in Dairying.

The forty-first annual examination for the National Diploma in Dairying took place in September at the University and British Dairy Institute, Reading, for England and Welsh students, and at the Dairy School for Scotland, Auchincruive, Ayr, for Scottish students. Eighty-five candidates were examined at the English centre, of whom thirty were awarded the Diploma; and sixty-six presented themselves at the Scottish Centre, of whom forty obtained the Diploma.

Following are the names of the successful candidates :—

ENGLISH CENTRE.

Diploma with Honours.

Egerton Martin Kidner, The University and British Dairy Institute Reading.

Diploma.

Elinor Gertrude ApThomas, The University and British Dairy Institute, Reading.
Margaret Armorey, Lancs. C.C. Dairy Farm, Hutton, Preston.
Margaret Ardern Blore, The University and British Dairy Institute, Reading.
Wilfred Boddy, Midland Agricultural College, Sutton Bonington.
William Bond, Midland Agricultural College, Sutton Bonington.
Clarice Burt, Midland Agricultural College, Sutton Bonington.
Sydney Gwyn Davies, University College of Wales, Aberystwyth.
Edna Foster, The University and British Dairy Institute, Reading.
Marion Groves, Lancs. C.C. Dairy School, Hutton, Preston.
Ruth Hambly, The University and British Dairy Institute, Reading.
Agnes Hunter Holmes, The University and British Dairy Institute, Reading.
John Stephen Hopkins, The University and British Dairy Institute, Reading.
Thomas Idwal Jones, University College of Wales, Aberystwyth.
Samuel Frank Martin, Midland Agricultural College, Sutton Bonington.

EMMELINE ANNE MOORE, The University and British Dairy Institute, Reading.
DENNIS IVAN MORTIMER, Midland Agricultural College, Sutton Bonington.
AUDREY JOYCE PETERS, The University and British Dairy Institute, Reading.
DILYS MARY PHILLIPS, The University and British Dairy Institute, Reading.
JAMES BERTRAM PRESSWOOD, The University and British Dairy Institute, Reading.
IDA GRACE PERCY ROBERTS, The University and British Dairy Institute, Reading.
ELINOR MABEL CAPON ROPER, East Anglian Institute of Agriculture, Chelmsford.
GRAHAM DENNIS SIMONS, University College of Wales, Aberystwyth.
WILLIAM BUCKLAND SMITH, East Anglian Institute of Agriculture, Chelmsford.
FREDERICK JOHN SOWERBY, Midland Agricultural College, Sutton Bonington.
ELIZABETH TURNER, Midland Agricultural College, Sutton Bonington.
JOHN MARTIN WILLCOCK, Seale Hayne Agricultural College, Newton Abbot.
KENNETH PERCEVAL WILLIAMS, University College of Wales, Aberystwyth.
GEORGE DOUGLAS WINTER, Seale Hayne Agricultural College, Newton Abbot.
GLADYS MARY YEOMANS, Midland Agricultural College, Sutton Bonington.

Passed Part I.

BARBARA CONSTANCE TAYLOR, Studley College, Warwickshire.

SCOTTISH CENTRE.

Diploma.

MARY F. CAMPBELL, Mains Street, Port Charlotte, Isle of Islay.
RONALD CRICHTON, 286, Wedderlea Drive, Cardonald, Glasgow.
ROBERT ARCHIBALD DYKE, Maseru, Basutoland, South Africa.
JANET R. L. ELLIOT, Thirlestane, Lauder, Berwickshire.
ALAN SCOTT GAGE, 8, Fife Road, Darlington.
JANET INGLIS GRAY, Langdales Farm, Greengairs, by Airdrie, Lanarkshire.
ALLAN GREIG, Nether Dysart, Montrose, Angus.
JANET BOWIE HOLMES, Gowanfield, Crieff, Perthshire.
ANDREW HOWIE, Crosslet Farm, Dumbarton.
EDNA ELISE JACKSON, Bridge End, Lorton, Cockermouth, Cumberland.
REGINALD KENNEY, 15, Mordaunt House, Larkhall Estate, London, S.W.
MAY ARMOUR LAMBIE, Nether Pratis, Leven, Fife.
JOHN E. LEWIS, Spencer House, Lipson Road, Plymouth.
JOHN LOCKHART, 41, Inverkar Road, Ayr.
JESSE CAMPBELL MITCHELL MCCALL, 667, Stirling Road, Luggiebank by Cumbernauld Station, Lanarkshire.
PARLAN JAMES MACFARLAN, Faslane, Shandon, Dumbartonshire.
JAMES MCGIBBON, Laigh, Bolernock, Shandon, Dumbartonshire.
MARY MACLEAN, Wester New Forres, Forres, Moray.
M. A. MCVICAR, "Knockalva," Kilmichael-Glassary, by Lochgilphead, Argyllshire.
JOHN MAIDMENT, Scarr Farm, Nessfield, Ilkley, Yorkshire.

Ann S. Mathers, Broadmuir, Cruden Bay, Aberdeenshire.
Thomas Morgan, Knaps, Longside, Aberdeenshire.
Margaret J. Orr, Culzean Gardens, Maybole, Ayrshire.
Jane Paterson, Milton-of-Tordarroch, Farr, by Inverness.
Charles Edward Lionel Powell, Rindleford Mill House, Rindleford, Bridgnorth, Shropshire.
Mandayam Chakravarthy Rangasamy, Imperial Dairy Institute, Wellington (Nilgiris), India.
Margaret Kevan Russell, Balsier, Sorbie, Wigtownshire.
Isabella Sanderson, Harelawside, Grantshouse, Berwickshire.
Archibald Boyle Smart, Woodlands, Strathaven Road, East Kilbride.
Jeanie Rankin Smith, Middleyard, Galston, Ayrshire.
Nancy M. H. Sonley, The Laurels, Barton-le-Street, Malton, Yorks.
John Steven, Bilbster, by Wick, Caithness.
James Paterson Struthers, Raehills, Whitemoss Road, East Kilbride.
Thomas Henry Thompson, High Cummersdale Farm, Carlisle.
Betty H. Tod, Johmar, Innerleithen, Peeblesshire.
Christina C. Tulloch, Ennisfirth, Northmavine, Shetland.
Harish Chandra Verma, 46, Cockburn Road, Bangalore, India.
Marion M. Walmsley, 17, Grange Road, Vicar's Cross, Chester.
Kathleen Mary Moffatt Ward, Eastgate Farm, Eastgate, Co. Durham.
Geoffrey Williamson, Dickinson Place, Allonby, Maryport, Cumberland.

All the candidates at the Scottish Centre had been students at the Auchincruive Dairy School.

The Diploma has also been awarded to **Frank A. Hunt**, of Sydney's Hope Estates, Warrenton, C.P., South Africa, who was examined at the Scottish Centre in 1935, and was given special permission to re-sit two Papers in South Africa.

Gold Medal for 1936.

The Society's Gold Medal and Honorary Membership for distinguished services to agriculture has this year been presented to Sir William Cecil Dampier, Sc.D., F.R.S. For some years Sir William has devoted his energies to the organization and development of agricultural research. He was the first secretary of the Agricultural Research Council and steered that body to success through its early difficult years. In recognition of his services to the nation in the field of agriculture and economics he received the honour of knighthood in 1931. For the past fifteen years Sir William has served on the Society's Council as a " nominated member."

Representation on other Bodies.

Mr. Thomas Neame has succeeded the late Lord Cornwallis as the Society's representative Governor of the South Eastern Agricultural College. Mr. E. E. E. Welby-Everard, of Gosberton House, Spalding, has been appointed as the Society's representative Governor on Cowley's Charity, Donington, in place of the late Mr. Edward Smith. Mr. R. H. Evans has been appointed to represent the Society in place of the late Mr. Burkitt on the British Standards Institution Technical Committee on standards for use in the Dairying Industry. As its representatives on the Court of Governors of the Royal Veterinary College, under its proposed new Charter, the Council have nominated H.R.H. The Duke of Gloucester, K.G., Lord Mildmay of Flete, Sir Archibald Weigall, K.C.M.G., and Col. E. W. Stanyforth.

By Order of the Council,
T. B. TURNER,
Secretary.

16 Bedford Square,
London, W.C.1.

ANNUAL REPORT FOR 1936 OF THE VICE-PRINCIPAL OF THE ROYAL VETERINARY COLLEGE.

During the year members of the Society have, as usual, taken advantage of their privileges by consulting the Royal Veterinary College (through their local veterinary surgeons in many cases) in certain ailments of farm stock, and the College staff have freely given assistance in elucidating obscure disease problems, suggesting means either preventive or curative by which the losses have been curtailed.

There has been a continued demand for advice and laboratory help in the control of *Mastitis*, the most common form of which (a chronic one) can be controlled by the separation of infected and non-infected cows based on the laboratory tests of their milk. This laboratory test is necessary because the milk of many cows, which do not show obvious disease, nevertheless contains large numbers of infective organisms, which may be the means of spreading the disease, mainly during milking. The milk of all adult females should be tested. In this way it is possible to detect infected animals and prevent the spread of infection to the healthy ones. Heifers are generally free from this particular form of infection.

A special service at a reduced fee has been instituted for herds in which all adult females are tested at regular intervals with a view to the control and eradication of mastitis.

Another more acute form of mastitis which has been serious in certain machine-milked herds has disappeared following alterations of the degree of vacuum, etc.

In the case of *Contagious Abortion*, eradication on the basis of blood agglutination test is now being increasingly recognized as the best way of dealing with the disease wherever separation of infected and non-infected cows is at all possible. There is a growing and welcome tendency on the part of owners to have all breeding animals in the herd tested with a view to eradication rather than to test a few individual animals which are for some reason suspect. A blood test of all animals of breeding age is necessary, because many infected animals do not abort. These, nevertheless, excrete a large number of infective organisms and are serious sources of further spread. They can be detected by a blood test and preventive measures taken.

Essential points which have to be emphasized in control are the separation of reactors and non-reactors when at liberty in pastures or in yards, and the value of calving down all animals in boxes, as it is at this time that there is most risk of the spread of infection. When tied up it is worth while to note that it is possible to keep reactors and non-reactors in the same shed without danger of spread. Great care should be taken with newly purchased animals, which should be isolated until tested. That this eradication work is gaining popularity is evidenced by the numerous requests which reach the Research Institute.

A special service at a reduced fee has also been instituted for herds in which all breeding stock are blood-tested at regular intervals for the control and eradication of contagious abortion.

The existence in this country of a form of contagious abortion associated with an entirely different agent, a small protozoan, and characterized by early abortion (often unobserved), and the return to the male at two to four months, or by chronic metritis, has been established. It is important that its occurrence should be diagnosed and its spread prevented.

A number of enquiries have been made regarding disease in young calves, and a large number of carcases have reached the College for post-mortem examination. This work is subsidised by a grant from the Research Committee of the R.A.S.E.

Investigations have been made into the common diseases, including the *White Scour*, of calves and attempts are being made to distinguish between those races of *Bacterium coli*, which cause the disease, from those that are normally present and produce no effects.

In regard to other farm animals, advice has been given in respect of the treatment of warbles in cattle, elimination of lice from horses, mineral deficiency diseases, and the effects of intestinal worms in colts ; whilst numerous post-mortem examinations have also been made of pigs in connection with outbreaks of infectious disease.

The Intradermal Tuberculin Test.—During recent years the double intradermal method of applying tuberculin tests to cattle has become widely adopted. Experience of this method has shown that in general it is a highly satisfactory test, but, as in the case of all tests of this nature, a small proportion of aberrant results is met with from time to time. It has been found, for example, that tuberculins prepared from glycerine veal broth and subsequently concentrated by heat may sometimes contain substances which are responsible for the production of non-specific pseudo-positive reactions (Buxton and Glover, 1934–35). This difficulty has been overcome by the use of a purified form of tuberculin prepared from a special medium. This so-called " synthetic medium tuberculin " has given eminently satisfactory results. Other difficulties may, however, arise in the course of attempts to eradicate tuberculosis from herds by the systematic application of tuberculin tests. With a view to elucidating some of these problems, the Institute of Animal Pathology at Cambridge, in collaboration with the Joint Tuberculosis Committee of the Medical Research Council and Agricultural Research Council, with funds provided by the Milk Marketing Board, carried out an extensive investigation into the specificity of the intradermal method of testing.

The enquiry has embraced such questions as the area of skin sensitized by the first dose of tuberculin or subsequently rendered less sensitive ; the duration of loss of sensitivity ; circumstances under which the test might purposely be rendered useless ; the effect of repeated injections upon the subsequent reliability of a test dose, and the specificity of the test in the face of infections with certain other organisms of an acid-fast and non-acid-fast character.

The investigation is not yet completed, but certain interesting facts have already been established.

It has been found, for example, that, in the case of tuberculous cattle which are highly responsive to the tuberculin, well defined areas of increased sensitivity of from 4 to 6 inches in diameter are formed around the site of the original test and persist for from forty-eight hours to fourteen days. During the third and fourth weeks, however, these areas become progressively less sensitive until the reactions are less marked in them than in other parts of the skin. Normal sensitivity is restored at about the sixth week. This observation suggests that, when a re-test is necessary in cattle, by the intradermal route, it is advisable to select areas which are at least 6 inches from the site of the previous injection. These tests were performed in the usual situation, namely, the side of the neck. Similar examination of the sensitivity of the subcaudal fold showed that both subcutaneous and intradermal injections of tuberculin produced some degree of sensitization in a proportion of the animals at about the third week. It was, however, less marked than in the skin of the neck, and this is regarded as being due to the lower sentitivity of the skin in this situation.

It has been suggested that in animals which have given an indefinite type of reaction to an intradermal test an intravenous injection of tuberculin may accentuate the character of the reaction. No evidence in support of this claim was obtained, but it is admitted that, since the animals used in these experiments had been rendered allergic by means of B.C.G., similar results might not be obtained in naturally infected animals. Attempts to determine whether a non-specific sensitiveness to tuberculin can be induced in tuberculosis-free cattle by repeated intradermal injections of various types of tuberculin showed that, in the case of unheated tuberculin protein, there was a definite sensitization after three or four injections. On the other hand, tuberculins which had been heated for two hours at a temperature of 100° C. in the course of their preparation did not produce this sensitiveness. It would, therefore, seem to be unwise to use undenatured tuberculins for the routine testing of cattle.

One of the advantages claimed for the intradermal test over the subcutaneous method lies in the fact that in tuberculous animals it is very difficult to mask the reaction by a previous subcutaneous injection of tuberculin. It has already been shown by Buxton that tuberculous cattle continue to give clear-cut reaction to the double intradermal test, although they have previously received large doses of tuberculin by the subcutaneous route. In this investigation an attempt was made to desensitize allergic cattle by the intravenous administration of tuberculin. Various preparations were used, including dilute tuberculin, heat-concentrated synthetic medium and precipitated synthetic medium tuberculins as well as "old" tuberculin. The dose varied from 1·0 c.c. to 50 c.c., in the case of the dilute tuberculin, and from 0·1 c.c. to 5·0 c.c. in the case of the concentrated preparations. There was no evidence that the subsequent reaction to the double intradermal test had been influenced by the previous intravenous injection of relatively large doses of tuberculin.

Not the least interesting part of the investigation was that concerned with testing the reliability of the double intradermal method in young cattle which had been infected with acid-fast organisms, other than the bovine tubercle bacillus, such as

Mycobacterium phlei, M. paratuberculosis (Johne's bacillus) and *M. tuberculosis avis*, and with such common non-acid-fast organisms as *Corynebacterium pyogenes, C. pseudo-tuberculosis ovis, Actinomyces bovis, Actinobacillus ligniersi* and *Br. abortus*. In the case of the latter group, there was no evidence of sensitiveness to synthetic medium tuberculin by the first four. Interesting results were, however, obtained by *Br. abortus*. When living organisms were injected intravenously no evidence of sensitization was obtained, but when suspensions in gum acacia and olive oil, or in normal saline solution, were injected subcutaneously a proportion of the animals became temporarily sensitive to "old" tuberculin. The majority of the animals were consistently negative to synthetic medium tuberculin, but in one instance a reaction was observed. The number of animals used was too small to permit of any definite conclusions being arrived at, but the results are of sufficient importance to warrant further study.

In the case of the acid-fast organisms, it was to be expected from observations in the field that two at least, namely the avian type of tubercle bacillus and Johne's bacillus, would render non-tuberculous animals sensitive to mammalian tuberculin, and such proved to be the case. During the first few weeks following experimental infection with these organisms, the animals were highly allergic to "johnin" and to avian tuberculin and also gave definite reactions to mammalian tuberculin. As the degree of sensitiveness declined, however, the reaction to the mammalian tuberculin decreased until eventually the animals ceased to respond to it, although they continued to react to "johnin" and avian tuberculin respectively. It is evident, therefore, that some degree of cross reaction is to be expected in animals which are *highly* allergic as a result of infection with Johne's bacillus or the avian tubercle bacillus. These points are of considerable importance in schemes which are devised to eradicate tuberculosis from cattle by systematic testing with tuberculin, and indicate the desirability of using purified and highly specific forms of the diagnostic agent.

The satisfactory progress in 1935 in the control of diseases in farm stock has been well maintained in 1936.

In the case of *Foot-and-Mouth Disease* the figures were :—

Year.	Number of outbreaks.	Animals slaughtered.
1933	87	7,805
1934	79	10,302
1935	56	12,444
1936	67	5,114

In 1936 :—

Month.	Great Britain.	France.	Germany.	Holland.	Belgium.
January	4	60	147	5	1
February . . .	—	52	98	10	—
March	—	42	50	7	—
April	—	47	16	2	—
May	—	15	14	6	3
June	—	11	23	3	12
July	—	29	10	5	2
August	—	35	1	2	—
September . . .	1	182	—	—	—
October	16	21	—	—	—
November . . .	17	14	8	—	—
December . . .	29	16	4	—	—
TOTAL .	67	524	371	40	18

Glanders and Rabies.—Again it has to be reported that no case of glanders or rabies has occurred in Great Britain. The last case of glanders was confirmed eight years ago (1928), and no case of rabies has occurred in this country since 1922.

It is interesting to note that the following diseases were eradicated in Great Britain in the years indicated : Cattle plague, or rinder-pest (*pestis bovina*), 1877 ; pleuro-pneumonia (*peri-pneumonia contagiosa bovum*), 1898 ; sheep pox (*variola ovium*), 1850 ; epizootic lymphangitis (*lymphangitis epizootica*), 1906. Dourine has never existed in Great Britain.

Bovine Tuberculosis.—The following table shows the number of animals slaughtered under the Tuberculosis Order of 1925 :—

Year.	Animals slaughtered.
1932	19,027
1933	20,908
1934	22,009
1935	22,203
1936	—

In the case of *Anthrax* the figures are not quite so favourable as last year.

Year.	Outbreaks.	Number of animals attacked.
1932	344	418
1933	297	345
1934	395	453
1935	386	443
1936	468	549

In the case of *Swine Fever* a slight decrease in the number of outbreaks will be noted.

Year.	Number of outbreaks.
1932	1,555
1933	1,414
1934	1,832
1935	2,049
1936	1,873

The position regarding *Sheep Scab* is very much more favourable than in 1935, again a decrease of over 40 per cent. in the number of outbreaks.

Year.	Number of outbreaks.
1932	361
1933	518
1934	684
1935	477
1936	249

Parasitic Mange shows a slight increase over 1935. The number of animals attacked was higher in 1936 (111) than in 1935 (99), and the number of animals affected 254 against 222.

Professor G. H. Wooldridge, F.R.C.V.S., M.R.I.A.

ANNUAL REPORT FOR 1936 OF THE CONSULTING CHEMIST.

The work of the Society's Laboratory during 1936 has followed much the same course as in recent years. 110 samples, as against 93 in the previous twelve months, have been submitted for analysis. Such as are of special interest are reported on later.

Fertilisers and Feeding Stuffs Act, 1926.—The Chemical Committee has been occupied mainly with the consideration of the practical working of the Fertilisers and Feeding Stuffs Act of 1926. As was explained in my Annual Report for 1935, this Act is undoubtedly a great improvement on its predecessor of 1906, particularly in that it gives the purchaser a legal guarantee as to the nature and quality of what he buys; yet the Act fails to provide effective machinery for action under what are called its "criminal" clauses. So much care has been taken to safeguard the interests of traders and importers that, when it has come to a matter of anything seriously faulty or wrong, it has been found almost impossible to follow up the case and to " get at " the person or persons who have really been to blame.

The Advisory Committee of the Ministry has issued various reports and recommendations for improving the Regulations made under the Act, and though these recommendations have been adopted by the Ministry, yet they have not been fully enforced, and the difficulty of proceeding with a criminal action has remained as great as before. County Councils have had their decisions over-ruled, and have lost interest in the administration of the Act, so that this has come to be, in effect, merely a means of enabling a purchaser to recover, from the immediate seller, compensation for any deficiency found on analysis of a sample taken at his own farm, or for any injury which he may have suffered through the illness or death of his stock. And here the matter has ended, nothing effective having been done either in the way of punishing offenders or to secure the general purity and good condition of the articles covered by the Act.

This last was one of the main objects for which the Act was introduced, and it is, moreover, one of those to which, during my long service as Consulting Chemist to the Royal Agricultural Society of England, I have specially devoted myself. Indeed, the action now proposed to be taken had its origin in the fact that certain reports of mine, concerning the presence of castor in feeding stuffs, were met with refusal by the Ministry of the necessary permission to prosecute. This permission was refused despite the greatest care on my part to comply with the requirements of the Act and with the latest recommendations of the Advisory Council.

Formation of Special Committee.—This refusal brought matters to a head, and the Council of the R.A.S.E. acceded to my suggestion for an inquiry into the working of the Act. The upshot was the formation of a Special Committee composed of representatives of the leading agricultural organizations throughout the country, such as the National Farmers' Union, the County Councils' Association, the Central Land Valuers' Association, the Farmers' Club, the Central Chamber of Agriculture, the Society of Public Analysts, the Incorporated Society of Inspectors of Weights and Measures, and others. The R.A.S.E. was represented by Mr. Fred Smith (Chairman of the Chemical Committee), Mr. Gates, Major Jervoise, Mr. Egerton Quested and myself.

This Committee met on April 28th, and again on July 12th, and, after coming to an unanimous decision that the Act had failed to serve its full purpose and required improvement in certain material directions, drew up, for the information and consideration of the parent bodies represented, their suggestions on particular points that had been raised. The more important of these were :—

(1) The unnecessary distinction between the civil and criminal sections of the Act.
(2) The necessity for permission to take samples on a purchaser's premises, on which samples action might, if necessary, be subsequently taken.
(3) The assimilation of procedure to that of the Food and Drugs Act (Preservatives section) so as to allow of an offence being traced back to the original offender.
(4) The necessity of giving greater freedom to County Councils to take action on their own initiative.

These various points will be discussed at future meetings of the Committee ; meantime, it may suffice to say that the remarks already made by me were borne out by the majority of those present. The great difficulty at present is that, as the Act stands, it is not possible for a sample to be taken, for the purposes of prosecution, at a farm or on the premises of the purchaser ; and that when an error (or, it may be, a fraud) has been detected, it is most difficult to secure a formal sample of goods in a merchant's store or in course of transit, and still harder to trace the fault back to the original vendor or distributor.

It is much to be hoped that, either by an amendment of the Act, or, better still, by fresh legislation, the difficulties experienced in the working of an Act, which promised to be a very useful one, may be removed.

Meantime, it has to be recorded with satisfaction that, since the above proposals were first mooted, complaints regarding the presence of castor in feeding stuffs have, so far as my experience goes, become much rarer. These have not, indeed, ceased altogether, for the *Journal of the Ministry* for March, 1936, records a case where compensation to the extent of £900 was paid, in respect of earth-nut cake containing castor, which had been fed with fatal results to cattle.

Once again, I must urge the importance of the Advisory Committee's decision that no amount of castor, however small, can be permitted in foods sold to the farmers of this country ; and that the custom of the Trade, of allowing a certain proportion (·005 per cent.) of castor bean or husk in goods passed as " pure," is directly contrary to the rule laid down by the Advisory Committee and adopted by the Ministry. The only security for the purchaser is insistence on a guarantee that goods supplied to him are " castor-free."

Wheat Offals and Barley Meal.—Improvement has also to be recorded in regard to the purity of wheat offals and barley meal. After a long period the decision of the House of Lords in the case of R. & W. Paul, Ltd., *v.* The Wheat Commission was delivered on July 21st. The decision, though it concerned the production of the offals of wheat, did not turn directly upon the question of the nature of the products obtained from the milling of wheat in order to entitle them to be called "offals"; it was directed rather to the question whether the consignments in dispute were sold as food for stock or whether they were intended, or might have been used, for human consumption. The ruling of the House of Lords was to the effect that, if sold as "animal and poultry food," "wheat offals"—whatever amount of flour they might contain—were not subject to the payment of the tax put on flour by the Wheat Commission.

This decision, though settling an important point in dispute, did not affect the definition of "wheat offals," or fix any limit to the amount of flour which "wheat offals" might contain. Consequently, the definition of "wheat offals" as given in the Fertilisers and Feeding Stuffs Act—that they be "the product of wheat separated in the process of milling"—holds good. I shall, therefore, maintain the position that I have all along taken up, viz., that the occurence, in a sample of "wheat offals," of a greater amount of flour than would result from the milling of a sample of wheat, must constitute a breach of the Act. This insistence has been rendered the more necessary because of the practice of mixing genuine "wheat offals" with cheap foreign flour so as to obtain what are termed "fine offals." The Fertilisers and Feeding Stuffs Act further requires a statement of the amount of fibre in "wheat offals." It is only right that a purchaser should have such a statement, in order that he may know the kind of offals he is buying, and whether the particular product, be it coarse bran, fine bran, middlings or other grade of offals, be suited to his particular requirements.

In regard to barley meal there has been a similar improvement. Advantage has been taken of the proviso in the amended regulations whereby the seller may declare a lower grade—known as Grade II—of barley meal. I do not, indeed, regard this as altogether satisfactory. I consider that anything sold under the name "barley meal" should consist practically of barley only, and so be entitled to be considered "pure" in the same way that "wheat meal" is. Moreover, it is extremely difficult to say with any approach to accuracy, what percentage of barley is present in a particular sample and whether it conforms to the requirement of being "96 per cent. pure" (barley meal), or "90 per cent. pure" (barley meal, Grade II). For my own part, I would hesitate to commit myself to a direct statement of the actual percentage.

Dried Grass.—Considerable interest has been aroused by the introduction of the new process of securing grass for fodder by drying it artificially instead of making it into hay, or alternatively, converting it into silage. Several different types of grass-drying machines have been produced. I have, meantime, had a number of samples of grass, dried by different machines, sent me for analysis and report. I have had to point out to the senders, however, that the mere analysis of a sample of dried grass, without having something to compare it with (such, *e.g.*, as the grass before it has been subjected to the drying) is of but little use. If, however, one has the natural grass and the same grass after being artificially dried, it is possible to state how far the drying has been carried and whether the fodder has been improved or has deteriorated in the process. But even this is not sufficient for putting the process to an adequate test, for one ought to know also the yields per acre of fresh grass, dried grass, hay, etc., and the relative costs of the two methods of conservation. The proper plan to adopt is that which I carried out at the Woburn Experimental Farm in 1888, when I wished to compare hay and silage. Selecting a grass field of 5 acres of very uniform character throughout, I divided this into two portions, turning 2½ acres into hay and 2½ acres into silage, recording the weights of fresh and preserved herbage and the costs in both cases. Later on, the silage, as taken out, was weighed and used in a bullock-feeding experiment against the hay. In this way a record was obtained of the actual costs and the relative food values of the two materials. What one requires to know, in the case of artificially dried grass, is the comparative yields, costs and nutritive values of hay and dried grass under a given set of conditions. I give, however, later on in this report, and for what they may be worth, analyses of certain samples of dried grass that have been submitted to me. The variation in moisture between these, it will be seen, is considerable.

Fifty Years of Experimental Work at Woburn.—The next item for mention is the issue of the record of fifty years' work carried on at the Woburn Experimental Station. This record covers the period 1876–1926. For the first eight years of this period the work was under the direction of my father, and, after that, of myself. From 1876 until 1921 The Royal Agricultural Society had control, and then for five years I carried on the work myself. It was finally taken over, in 1926, by the Rothamsted authorities. The account forms a book entitled *Fifty Years of Field Experiments at the Woburn Experimental Station*, by Sir John Russell and myself, and forming one of the series of "Rothamsted Monographs on Agricultural Science." The book comprises an account, by myself, of the History of the Woburn Farm; and details of the experiments, together with a critical examination of the results and a setting-out of their lessons by Sir John Russell. Together with these are two contributions by members of the Rothamsted Staff—Mr. W. G. Cochran, who deals with the statistical aspects, and Dr. E. M. Crowther, who writes about the soils of the various experimental areas. The book comprises 392 pages with illustrations, diagrams, and numerous tables. It is published by Longmans, Green & Co., at a price of 21*s*.

Laboratory Work.—To pass now to details of the laboratory work, it may be said that during the year there has been, on the whole, little change in the supply or prices of artificial fertilisers. The changes with regard to potash manures having already been noted and allowed for, I have made no further changes in the Tables of Compensation for Unexhausted Manure Value which I regularly revise for the Central Association of Agricultural Valuers.

In regard to feeding stuffs, however, the changes have been considerable, the last few months having seen a marked rise in the prices of feeding cakes and of cereal and other meals. This rise has been from 20*s*. to 30*s*. a ton in the case of Linseed, Cotton, Earth-nut, and similar cakes, and nearly as much with cereal meals.

Fertilisers—as stated—have undergone little change of price, nor much as regards supply, except that further sources of potash salts have been opened up. A certain fluctuation in the price of sulphate of ammonia has always to be looked for, but the range of variation has not been wide, viz., from £7 per ton in January and £7 3*s*. 6*d*. in February to £6 14*s*. 6*d*. and £6 16*s*. per ton in autumn. Cyanamide (Nitrolim) has, as usual, followed the like course, but nitrate of soda has continued steadily at £7 12*s*. 6*d*. per ton throughout. Potash salts, until autumn, remained at last year's prices, then rising, in the case of muriate and sulphate of potash, to £8 1*s*. and £9 13*s*. per ton respectively.

Cases of adulteration of fertilisers have been very few, but mention is made later of a material sold as "Coloured Hoof Waste" which proved to be purely derived from milk-casein.

There would appear to have been a considerable increase in the demand for concentrated compound fertilisers, whose use permits considerable saving in transport charges and in cost of distribution.

Feeding stuffs have undergone considerable changes, mainly of price. Mention has been made of the decline in the number of instances in which castor has been found to be present in feeding stuffs, or of harm resulting from its presence. Perhaps the chief causes of complaint with feeding stuffs have been about the condition of meals and different offals rather than about the presence of objectionable ingredients. On the whole, however, there has been an improvement as regards wheat and barley meals and the like. Maize meal has generally, in my experience, maintained its excellent reputation for purity and good condition, though I found one sample to contain wheat, oats and weed seeds in some quantity. A like good reputation has been maintained in the case of such samples of Sussex ground oats as have been submitted to me.

There has been a large increase in the number of materials used in the compounding of poultry foods. A good deal of wheat has been utilized not for milling purposes but as a constituent of poultry mixtures. This has led to the favouring of varieties that yield a large grain and a heavy crop rather than such as give a good quality for the production of flour.

Linseed cake and cotton cake have maintained their popularity on the farm. The price of the former ranged from £7 7*s*. 6*d*. per ton at the beginning of the year to £8 in July and £8 12*s*. 6*d*. in August, while undecorticated cotton cake similarly increased in price from £4 10*s*. per ton in January to £5 in July, and £5 10*s*. per ton later on.

Ground-nut cake has been steadier at £7 to £7 15*s*. per ton, but soya bean cake and the oil-extracted meal have been, of late months, very expensive at £9 2*s*. 6*d*. and £9 per ton respectively.

Of palm-nut cake and meal, as also of coconut cake, one now hears but seldom. Maize and its products have continued to rise in favour. Maize in its different forms has seen changes of price; the meal, starting at £4 15*s*. per ton, rose to £6 10*s*. per ton in autumn.

The various offals of wheat have undergone comparatively small changes in price, but Sussex ground oats—which must be considered more or less as a "fancy" article—have risen from £7 5*s*. to as much as £9 per ton. Prices of such materials as white fish meal, meat meal, and meat-and-bone meal for feeding purposes have throughout remained much as they were.

I now record a few further matters of interest which have arisen out of my ordinary analytical work for Members of the Society.

ACTION OF WATER ON METALS.

(*a*) *Lead.*—During the year several cases have been referred to me where waters—generally of a soft nature—were found to have acted on metal pipes, boilers, etc. Most of these concerned the action of soft waters upon lead.

Two samples of water coming from the neighbourhood of Tavistock (Devon) were sent, one being from a tank in a wood, the other from a tap in a dwelling house. These gave only five to six grains per gallon of total solids, and were found to be chemically and bacteriologically good. While, however, the water from the tank in the wood was free from lead, that drawn from a tap in the house was found to contain in solution 1/20th grain per gallon of lead. A water such as this must be considered an undesirable one for a regular supply. On enquiry it was found that a new lead pipe had been recently put in in replacement of former earthenware pipes, the water being conveyed in the lead pipe for about a quarter of a mile.

It was suggested by the sender that if the water were allowed to run to waste for some time, through the pipe, the trouble might disappear. Without agreeing with this prediction, I examined two other samples sent me from a neighbouring source, one being from the intake tank in a pasture field, the other from a tap in a cottage which was reached through 500 feet of iron pipe followed by 500 feet of lead pipe. Similar results were found, the water from the pasture field being free from lead, while that from the house tap containing the objectionable amount of 1/7th grain per gallon.

Subsequent to this, three further samples reached me from independent sources in the same neighbourhood, the service pipes being lead ones in each case. These samples contained, respectively, 1/130, 1/10, and 1/20 grain of lead per gallon. The amounts of lead in Nos. 2 and 3 are decidedly objectionable.

In all such cases as these where water is excessively soft the use of lead pipes should be avoided. In theory it is a safeguard if the water, before passing the lead pipe, is hardened by the use of lime, but constant watchfulness is necessary if this precaution is to be effective. The best thing is to use iron pipes for the cold supply, coated inside with Dr. Angus Smith's composition or like protecting material, and copper for hot-water pipes or boilers.

(*b*) *Copper.*—It is not usual to find copper causing any trouble in water supplies. In a case brought to my notice, however, complaint was made that sponges, after being used with hot water, took on a greenish colour, whilst the bath was similarly stained. On examination, the sponges were found to be impregnated with copper, this having come from the hot-water pipes employed.

I was considerably surprised that the water in question should have had this action on the pipes, its composition not being such as would have led me to suspect that such action would occur. The water contained 40·6 grains per gallon of total solids (15·26 grains of this being lime) and giving a "total hardness" of 25·2°. The chlorine amounted to only 2·38 grains per gallon and little nitrate, ammonia or dissolved organic matter was present. The hot water was found to contain copper in solution, but the cold water had a faint trace only. Treatment with weak acetic acid would remove any trouble of this kind.

(*c*) *Zinc.*—The water from a newly-dug well gave 20·44 grains per gallon of total solids. The water, nevertheless, was found to have acted on the galvanized pipes used and to contain as much as ·21 grains of zinc per gallon. This, though probably harmless, is certainly not desirable. The trouble probably arose from imperfect galvanizing of the pipes.

WATER CONTAINING MUCH CARBONATE OF SODA.

A sample of water sent me from Habrough, Lincolnshire, gave so unusual an analysis that I was led to make enquiries about the origin of the supply. I was informed that it was a perfectly natural supply taken from a bore-hole recently put down. Two other waters, sent at the same time, contained 42 and 78 grains per gallon, respectively, of total solids, consisting mainly of carbonate of lime. The first sample gave no less than 80·08 grains per gallon of total solids, consisting mainly (in place of carbonate of lime) of carbonate of soda. The water was thus of the nature of that of a mineral spring, and could hardly be regarded as suitable for regular drinking purposes.

DRIED GRASS.

The general facts connected with the introduction of grass-drying having been referred to, it remains to give analyses of some samples sent me. My account of these could have been more complete had I been able to state not merely the analysis of the dried product, but also that of the corresponding grass, with particulars of the type of machine used and an estimate of the cost of drying. In one case only did I receive samples of the wet grass and that of the same lot of grass dried. These two are the first named in the accompanying list :—

	A. Wet Grass	B. Grass, as A, dried.	C.	D.	E.	F.	G.	H.
Moisture	74·06	30·30	6·16	9·16	6·27	9·73	7·78	9·19
Ether Extract	·73	2·36	3·72	4·38	4·60	4·53	2·68	5·68
Albuminoids.	5·34	13·76	13·12	14·81	18·81	17·31	7·31	14·38
Carbohydrates, etc.	10·06	30·05	37·78	43·54	44·11	41·58	50·09	38·94
Woody Fibre	7·35	17·47	10·25	19·62	14·85	18·76	25·61	21·19
Mineral Matter	2·46	6·06	28·97	8·49	11·36	8·09	6·53	10·62
	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00
Nitrogen	·85	2·20	2·10	2·37	3·01	2·77	1·17	2·30
Sand and Silica	·60	1·64	22·76	1·73	4·68	2·63	1·62	4·21

Sample B was imperfectly dried and would have been hardly likely to keep well. As compared with the original grass (A), the analysis showed no sign of deterioration in quality, but the material would certainly have required to pass again through the drier. Sample D was in excellent condition and had a fragrant aroma, being more like hay than dried grass ; the grass, however, was not of high quality, being low in albuminoids and high in fibre. Sample E was a good one, showing only 6·2 per cent. of moisture. It had retained its green colour and had, moreover, a high albuminoid and a low fibre content. Sample F had been dried within three hours of cutting—it was park-land grass.

G was grass which had been exposed to a heavy day's rain and had then been put four times through the drier—drying having taken 50 minutes to complete. H was not at all a nice sample.

I subsequently learned that a sample similar to that represented by B was, the same day, put twice through the "drier," and gave 28 per cent. of moisture. When grass is dried by the Imperial Chemical Industries plant, it is usual to get the percentage of moisture down to 3 or 4 per cent., and the occurrence of damp patches in the product is thus avoided. The material, however, takes up moisture again on storage and may ultimately reach a moisture content of about 16 per cent.

BARLEY MEAL AND WHEAT OFFALS.

I have mentioned a general improvement in the purity of barley meal and the offals of wheat. Nevertheless, care must still be taken in the purchase of these articles, as the following cases show.

(*a*) *Barley Meal.*—At the time of receipt of a sample, good barley meal was quoted at £6 5*s*. per ton; a member, tempted doubtless by the lower price, sent me a sample of what he had bought as barley meal at £5 10*s*. per ton. On analysing the sample I found that it gave only 2·26 per cent. of mineral matter, whereas pure barley meal has 3 per cent. or more. The meal had flour added to it, and was certainly not barley meal as required by the Act ("the produce of barley as grown"). It also contained considerable amounts of oats and wheat, together with corn cockle and other weed seeds. I was subsequently informed that the meal was made from foreign barley.

(*b*) *Wheat Middlings.*—A sample sent me under the name "Australian and Brazilian Middlings" proved to be dirty and impure, containing rye as well as weed seeds in some quantity.

MISCELLANEOUS.

Condiment.—A sample of "patent food" was sent to me, the purchaser having been told that the use of it would effect a great saving in his cake bill. The price was 58*s*. per cwt.! The sample proved to consist mainly of Linseed and Rice, together with liquorice; the price, accordingly, was an extravagant one.

Hoofs and Horns.—A sample sent to me under this name was found, on examination, not to be such material at all, but to consist purely of milk-casein probably treated with formalin. Such material is obtained from the manufacture of buttons, umbrella handles, etc. Fifteen tons of the material had been bought by a farmer upon a mere guarantee of its nitrogen content, and without any statement as to the source of the nitrogen. Such material is obviously very different from hoof-and-horn manure, which will decompose fairly rapidly in the soil and supply organic nitrogenous matter to it, whereas the dried milk-casein, being a dense material and prepared with formalin, would be to a large extent useless as a fertiliser. On enquiry it was found that the material had come from New York, where it was being sold as "button waste." On arrival in this country, however, its name was changed to "Coloured Hoof Waste" and it was sold as such to farmers.

Spent Charcoal Dust.—This is known as "spent char" and was formerly in frequent use for superphosphate-making. A sample sent to me under this name proved to be properly described and gave the following analysis :—

Moisture and Organic Matter	13·35
*Phosphoric Acid	33·26
Lime	46·81
Insoluble Siliceous Matter	·86
Carbonic Acid, Magnesia, etc.	5·72
	100·00
*Equal to Tribasic Phosphate of Lime	72·64

Though quite a good and genuine sample, such a material is not readily soluble, and would act but slowly in the soil if applied without treatment.

The following is the list of samples sent by Members for analysis during the twelve months, December 1st, 1935, to November 30th, 1936 :—

Linseed cake	1
Cotton cake	4
Groundnut cake	1
Compound feeding cakes and meals	3
Cereals, offals, etc.	4
Dried grass	9
Fish meal	2
Poultry foods	5
Pig foods	6
Basic Slag	1
Compound manures	5
Bone Meal	1
Shoddy, etc.	13
Lime	1
Milk, butter, cream, etc.	4
Soils	11
Waters	30
Miscellaneous	9
	110

J. AUGUSTUS VOELCKER.

Tudor Street,
London, E.C. 4.

ANNUAL REPORT FOR 1936 OF THE BOTANIST.

The weather conditions during the greater part of 1936 formed a great contrast with those of the three previous seasons. The spell of dry years was broken and in its place came a season characterized for most of its duration by a heavy rainfall and lack of sunshine. Growers thus no longer had to contend with the effects of drought but rather with those associated with an excess of water in the soil. The enquiries received in the Botanical Department were naturally influenced by these conditions.

The most striking differences between 1936 and 1935 can be shortly summarized and then, where of sufficient interest, discussed in detail. In the first place, the problems of grassland formation and management appeared to be almost non-existent. Their place was taken by the problems of arable cultivation, first of all with the difficulties caused by failures to sow the normal areas of cereals in the autumn ; then, in the summer, by an excessive growth of weeds and, throughout the season, by pathological troubles caused either by water-logging and mulnutrition or by a series of epidemics of common fungoid diseases. These accounted for more enquiries than any other subject.

But, unusual as the conditions were, the total number of enquiries was lower than that of the previous season (1936, 152 enquiries; 1935, 160).

SEED TESTING.

Seed testing was again confined almost entirely to home-grown seeds about which there was some doubt either about their suitability for sowing on account of the presence of a few sprouted seeds or because of their contamination with weed seeds. The samples tested in the spring were on the whole fairly good and an increase in the seed rate to make up for a defective germinating capacity only had to be suggested once. The few samples of 1936-harvested seed so far tested have been either of wheat or winter oats. Their germinating capacity has ranged from 98 per cent. to 60 per cent., with that of the winter oats distinctly lower than that of the wheats.

A practice which has developed during the past few years is to send suspicious samples of seed potatoes to the Botanical Department for examination. It is worth doing, because even newly purchased Scotch grown seed has, of late years, often been heavily infected with various eye-destroying diseases. At least half-a-dozen of the common tuber diseases can easily be detected. Those found this season were dry-rot (*Fusarium* *cœruleum*) on May Queen and Sharpe's Express; skin spot (*Oospora pustulans*) on King Edwards; and powdery scab (*Spongospora subterranea*) on Great Scot. No seriously blighted samples were received, but on one sample small brown lesions had attracted the sender's attention, and these it was found were due to *Phytophthora infestans*. No specimens affected by the wart disease (*Synchytrium endobioticum*) were sent in.

WEEDS.

The specimens of weeds sent in for identification are, at times, of interest, for when their occurrence cannot be explained by the introduction of their seeds with those sown to produce the crop, the problem of their appearance may be a difficult one to solve. This year, although weed enquiries were more numerous than usual, no out-of-the-way plants were sent in. They were almost all the annual weeds of arable land. Their seeds had probably remained dormant in the soil, and even the unusually good conditions for cleaning the ground which were prevalent for the three previous years had had no effect on them. Spurrey, as it has several times before, headed the annual list, and this with the black bent (*Alopecurus agrestis*) accounted for about one half of this group of enquiries.

Poisonous plants were not represented in the list, the only one to which suspicion could be attached being corn-cockle. This was an unknown weed in the neighbourhood and was probably introduced with the seed of tares used in a silage mixture.

CEREALS.

At the beginning of 1936 the commonest subject of enquiry was concerned with supplementing the autumn sowings of wheat and winter oats by spring sowings. The sowing conditions in the autumn had been unfavourable and a considerable acreage had still to be drilled. At the same time partial failures, caused by the water-logging of the soil, called attention to the probability of having either to resow or to patch fields in which a deficiency of plants was becoming evident. The reply given to the early enquiries was that the seed reserved for the normal sowings should be put in as soon as practicable and, at all events, before the end of February. But in most parts of the country January and February sowings were impossible. The result was that an unusually large area had to be put down to spring varieties. In the case of the oat crop this caused no particular difficulties, for there is a wide choice of suitable varieties. With wheat, however, the choice is more or less limited to two, Red Marvel and April Bearded. The demand for these was abnormally large and several members reported their inability to obtain a supply of seed. This had been anticipated and information about the location of the available stocks had been obtained. As these became exhausted substitutes had to be found. As usual, "Manitoban" was offered by several of the seed merchants. This graded wheat consists mainly, or often entirely, of the well-known Marquis wheat. Generally, under English conditions, it is a bad cropper; even though, when sown at the usual rate of two bushels, the number of seeds per acre, on account of the diminutive size of the grain, is abnormally high. Up to the present no actual yields have been reported, but an excellent sample of grain, rubbed out at harvest time, was sent in by one member, who described the crop as "fair."

Another variety of which a supply was found was a continental wheat known as Kolben. Again no figures with regard to yield per acre are available, but the reports which have been received are so satisfactory that the hope seems justified that at last there is a substitute for Red Marvel.

The question of wheat varieties again came up in the autumn. There are at present on the market a number of new varieties which for the most part have been imported from the continent. Whilst they are fairly well known from the botanical standpoint there is no reliable evidence as to how they will crop here under ordinary conditions of farming. Until this is available the trial of these new varieties cannot be recommended except as an experiment.

PLANT DISEASES.

From the early spring until harvest time the year was characterized by the prevalence of fungoid diseases. Practically all of the usually recorded pests were present in the crops and some of them proved to be far more destructive than they have been in the past few years. Amongst these the potato blight due to *Phytophthora infestans* needs no detailed reference, but it may be useful to call attention to a few common diseases which, in their way, have been almost equally serious.

The first to put in an appearance was "clover sickness," the result in all the specimens examined of an attack by the fungus *Sclerotinia Trifolii*. It spread rapidly throughout February, both in pure crops of broad red clover and in crops of clover and Italian ryegrass. As the season progressed it became evident that the attack was unusually severe and more than one case was heard of fields being ploughed out on account of the excessive loss of plant. For the last three years the fungus has been common, so that by now there must be a very large acreage of infected land in the country. In the absence of any satisfactory curative measures the only practicable method of control is to starve the resting stage of the fungus out of the soil. The carrying over from year to year is affected by the small black masses, or "sclerotia," formed on the collar and the upper part of the tap roots of affected plants. Unfortunately they can live for a number of years in the soil in a dormant condition, and where the rotation involves the growing of clover every fourth year there can be no certainty that none are alive and ready to carry on the disease. Dropping the crop out of the rotation for once is the one reasonably certain method of securing uninfected soil. But with the present long spell of infections it is difficult to see how a sufficient area of red clover is to be grown if any comprehensive attempt is made to clean up the soil again.

The wheat crop of 1936 had never the healthy appearance of the crop of the previous year. It "gathered" badly in the spring and as the summer came on it was attacked by most of the usual wheat parasites. But, with one exception, namely *Ophiobolus graminis*, which is responsible for the disease known as "whiteheads," they probably did no more harm than usual. This disease was noticed early in July, but at the time the extent to which it was prevalent was not realized. As the crop began to colour specimens of diseased ears came in freely and further observations in the field made it clear that the attack was far more severe than it has been, so far, in this country. It is difficult to give any definite measure of the extent to which a crop is diseased. One member when asking for information about the disease wrote that at least half the crop was destroyed. Still worse cases were heard of. But in the worst case which there was an opportunity of investigating the percentage of diseased plants was approximately 25. A rough estimate based on counts made in thirty fields at harvest time gave an average of 14 per cent. of diseased plants. Inadequate as the figures are, they show without any question that this fungus is causing more damage in this country than seemed likely a few years ago. Though it has been frequently referred to in these Annual Reports a further description may be of use. The first symptoms generally calling attention to the presence of the disease are straws broken away from the base of the plants and falling about in all directions. These and the ears they carry become bleached, often before the crop begins to show signs of ripening. The ears are blind or at the most contain small, much shrivelled grain, and in a dry season they are white in colour no matter what the normal colour of the chaff is. In a wet season, however, they are discoloured and most frequently blackened by a growth of saprophytic moulds. This often leads observers unfamiliar with the disease to come to the conclusion that it is a somewhat unusual form of smut or bunt. These symptoms, however, are more or less identical for several other fungi known collectively as "foot-rots," and the diagnosis of the causative fungus is not always simple. It depends ultimately on the type of fruit formed by the fungus.

The fruits develop on the blackened bases of the plants and are generally to be found on the stubble in September and October. This season, however, the fruits were common enough during harvest and for once *Ophiobolus* could be recognized with certainty. The fungus is capable of remaining in a viable condition in the soil for a period which still has to be ascertained definitely. It probably takes some three or four years for the soil to lose the infection. As a consequence, if a second wheat crop is taken after one which has been attacked the chances are in favour of its becoming seriously affected. Such cases were not uncommon this season.

Up to the present, in spite of investigations in progress in most of the wheat growing countries, no method of controlling the disease has been discovered. It can only be got rid of, as in the case of the clover sickness fungus, by starving it out of the soil by refraining from growing a crop which it can attack for several years. Our system of crop rotation has probably prevented the disease from becoming as serious as it is in the great wheat exporting countries in which it is rapidly becoming one of the chief factors which limit the output.

Another disease which was more abundant than usual was American gooseberry mildew. The peak of the attack appears to have been somewhat late in the season, for no specimens of diseased fruit were sent in and there was no evidence at the time that infected berries were particularly abundant. But in July specimens of diseased shoots were sent in on three occasions, and a visit to a gooseberry growing district disclosed a state of affairs reminiscent of the intense epidemic which followed the first appearance of the causative fungus *Sphærotheca mors uvæ* some thirty years ago. Young, vigorously growing shoots were coated with a dense felt of mycelium from their tips downwards for some 6 inches or so, and on this an abundant crop of the ascus-containing fruits were developing. It was recognized that cutting off the shoots and burning them at this stage would destroy most of the crop but would at the same time result in a fresh development of succulent, readily infectable shoots. It seemed reasonable to suppose that this fresh growth could be protected by the use of a fungicide, so a few bushes were cleaned up by pruning out all obviously infected shoots, and then when the new growth began to appear they were sprayed with Burgundy mixture three times at fortnightly intervals. A report received after the falling of the foliage stated that the bushes were then free from any visible infection.

The grey mould (*Botrytis cinerea*) was abundant throughout the warmer parts of the year and later, in the autumn, it was to be found on a wide range of plants. The only outbreak to which attention was called was a somewhat unusual one. This occurred on lettuce plants about the middle of May and was so severe that practically every plant on an area of three acres was destroyed. The plants were set out in the open in a rather forward condition about Easter time and subjected very soon after to a spell of sleet and heavy icy rains. The resulting injuries were evidently very favourable for the development of the spores of the fungus.

Among the more unusual diseases were an outbreak of rust on a newly sown ley and two diseases of willow. The rust was reported to be so thick that the field was a bright orange colour. On sorting the herbage sent for examination it was found that perennial ryegrass was the only species to be attacked. This fact and the spore measurements made it certain that the rust was *Puccinia coronata.*

One of the willow diseases was proving troublesome in osier beds. The symptoms, a drooping and blackening of the foliage followed by the formation of cankers on the shoots, suggest that the fungus *Physalospora* was the cause, but no spore-bearing material was available at the time for examination. The other disease caused the sudden death of a large weeping willow. In the early summer the foliage, until then normal, began to turn yellow and by mid-August the tree was leafless and dead. An examination of some twigs and chips from the butt of the tree failed to disclose the presence of any fungus. Possibly it was a case of the widely spreading watermark disease which is known to be present in the neighbourhood.

R. H. Biffen.

School of Agriculture,
Cambridge.

ANNUAL REPORT FOR 1936 OF THE ZOOLOGIST.

Introduction.

On the whole, the year has been somewhat featureless from an entomological point of view. Most of the insect attacks reported have been by well-known pests, and generally on no very large scale, and there is little new to be said about them. The event of most importance was the discovery of the presence in England of the asparagus-fly, which has long been exceedingly destructive on the Continent, and a full account of it is given in this Report in order that extensive growers of this crop may be warned of its possible occurrence on their land.

Each year is generally characterized by the unusual abundance of certain insects, and this is true of 1936. "Cut-worms"—the caterpillars of Noctua moths—were reported as destructive to a wide variety of crops, and one of the moths, the "Silver Y," attracted attention by the numbers to be seen on the wing during the summer. Another point of interest was the frequency of attacks by chafer grubs, and especially by the grubs of the cockchafer. The cockchafer itself was comparatively rare last summer, but it may be expected in large numbers next May and June. As is always the case, insect attacks were greatly influenced by the weather, and the late sowing of crops, necessitated by weather conditions in the early spring, favoured some of the customary pests, notably frit-fly in oats.

CEREALS.

In addition to the usual toll taken of winter wheat by wireworm and leatherjacket, it was noticeable that cut-worms were particularly destructive everywhere, while in East Anglia most harm was done by the mud-beetle, *Helophorus nubilis*. In some districts re-sowing of wheat was rendered necessary through attacks of frit-fly.

Weather conditions prevented the early sowing of oats, and trouble from frit-fly was anticipated, and with reason. Many severe attacks were reported in June, but the pest was even more conspicuous at harvest time, when the second brood of the fly, which attacks the ear, was responsible for a notable diminution of yield in some districts. There were a few cases of damage to wheat by corn saw-fly and by Hessian fly—pests not much in evidence in recent years—and to oats by the stem eelworm.

FARM AND GARDEN CROPS.

Two pests have been conspicuous on almost all crops during the past year—cut-worms and chafer grubs. Both the garden chafer and the summer chafer were complained of, but most harm was done by the cockchafer, *Melolontha vulgaris*, whose larvæ were very destructive, though few of the adults were to be seen in May and June. There are indications that next year may be a "flight" year, when the beetles appear in extraordinary numbers. On the Continent, where this insect is a great pest to forestry, such "flight" years occur every fourth or fifth year —according to the climate—and advantage is taken of them to make a concerted attack on the beetles, which are more vulnerable as mature insects than as underground grubs.

Cut-worms, the fleshy caterpillars of Noctua moths, which feed mostly below the surface of the soil, were destructive to a great variety of crops. They were especially severe on mangold and beet, and in many cases the "Silver Y" moth, *Plusia gamma*, was identified as the species at work. The moths themselves, too, were unusually abundant during the summer.

A number of cut-worms, however, taken from sugar beet, and bred out by Petherbridge and Stapley at Cambridge, produced moths of a different and unexpected species—*Euxoa nigricans.*

There were many complaints of flea-beetle attack in the spring, but chiefly on plants of the *Brassica* tribe. Of the garden pests in the late summer, the celery-fly was unusually destructive. More important, however, was the discovery that a near relation of the celery-fly, the asparagus-fly, hitherto unknown here, had at length found its way to this country.

THE ASPARAGUS FLY

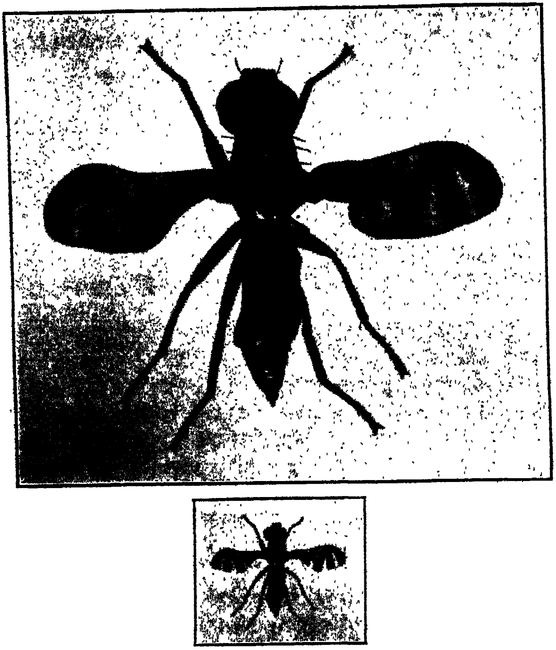
(*Platyparea pœcilloptera*, Schrank).

In November, 1935, I received a complaint of the total failure of an asparagus bed, which had been deteriorating for some time past. Very little material was procurable for examination, as most of the surviving stalks had been removed, but from the few samples sent two points emerged—first, that some very destructive pest, strange to our English asparagus grower, had been at work; and, secondly, that this pest was a fly (*Diptera*), since the ruined stalks contained some of the *puparia* (chrysalids) characteristic of that group of insects.

For many years past great damage to asparagus by a fly, *Platyparea pœcilloptera,* had been annually reported in various continental countries, and the natural conclusion was that this pest had now found its way to England. At this time of the year, however, there was very little to go upon, for it was long past the fly season, and the grubs had all turned to *puparia,* so that some doubt must remain until examples of the fly had been obtained from these *puparia,* which would not normally hatch out till spring. The matter seemed so important that I at once communicated with the Entomological Department of the Ministry of Agriculture and Fisheries, and Mr. J. C. F. Fryer quite agreed with my conclusions, which were corroborated in April, when specimens of the fly were bred out both in Cambridge and in Harpenden.

As this was the first recognition in England of what is, on the Continent, a very destructive pest, the urgency of the matter was obvious, and the Ministry took charge of the case with the view of exterminating the fly, if possible, before it obtained a firmer footing in the country.

The only insect pest of asparagus hitherto regarded as of any importance is the asparagus beetle—*Crioceris asparagi*—which occurs everywhere, and does some harm in causing malformation of shoots, and in lessening the yield where the crop is grown for seed. The damage due to it is trifling compared with that which may be wrought by the fly, which is capable, if unchecked, of entirely wiping out an asparagus bed in a few years. It is therefore most important that asparagus growers should carefully watch for its first appearance, and should take drastic measures against it at the earliest possible moment. The following account of the fly is intended to assist them in recognizing the pest, and to suggest such measures against it as the experience of foreign growers has led them to adopt.



The Asparagus fly, *Platyparea pœcilloptera*; the lower figure slightly enlarged; the upper figure × 5.

The fly was first described and named by Schrank in 1776, but it was not until 1847 that it appeared as a pest—in Germany. In 1862 it was reported from Austria, and in 1903 it had reached France, where it soon became firmly established in the neighbourhood of Paris. In 1912, Paul Lesne undertook a thorough investigation of the pest, and published papers on the subject in 1913 and 1915,[1] and the remedial measures used in France ever since have been almost entirely based on his recommendations. Since 1930 the German entomologist, M. Dingler, has published important papers on this pest.

Life History.—According to continental authorities, the fly is to be found from the middle of April till early in July. In the present instance, though flies were obtained from *puparia* by incubation in April, their appearance in the open was much later. The first specimen was taken at the end of May, and it was not until the first week of June that flies emerged in any numbers.

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[1] *Ann. du Service des Epiphyties*, Vol. I., p. 228; Vol. II., p. 266.

After pairing, the female fly visits the asparagus heads which it punctures with its ovipositor, usually laying an egg in the puncture, but in any case feeding on the fluid which exudes from the wound. Some eggs are deposited on the surface of the shoot, but these, it appears, do not hatch. The flies show a preference for two-year-old plants, either just emerging, or anything up to 20 inches in height. They are active in sunshine, but do not travel far from the food plant. Rain and persistent cold weather are fatal to many of the insects.

The eggs hatch in about three days, and the larvæ bore downwards in the stalk, sometimes causing a certain amount of malformation in the shoot, which tends to bend over to one side. At this early stage, however, little effect of the attack is seen, and in the heads cut for the table any further development of the minute larva, if present, is of course prevented. It is in the shoots which are allowed to grow up that the trouble becomes manifest.

The grubs bore right down the stem to the root collar but not into the root itself. If only a few are present they generally pupate in the stem a little below the ground level, but in cases of severe infestation the whole interior of the stem is disintegrated and many of the *puparia* are in the soil round its base.

P. Lesne found that in France the active stage of the attack ended in July, by the end of which month all the grubs had turned to *puparia*. In view of the later appearance of the fly in the English case, it would seem probable that the larvæ go on feeding well into August, but the measures taken to eradicate the pest prevented any observations being made on this point.

There does not appear to be any second brood, and the *puparia*—which correspond to the chrysalis of a moth—are the form in which the insect passes the winter and, indeed, the greater part of the year, and from which the fly emerges in the following spring. Unfortunately, they are very resistant to adverse circumstances such as frost, drought or excessive rain, nor are they easily killed by insecticides, and their great tenacity of life constitutes the chief difficulty in dealing with this most destructive pest.

Treatment.—We are fortunate in having at our disposal the experience of several continental countries, and the results obtained by well qualified entomologists who have made an intensive study of the asparagus-fly. It is, nevertheless, disquieting to find that no country has succeeded in eradicating the fly after it has once obtained a footing, and the most that has been achieved has been some mitigation of the injury caused by it. Lesne may be right in attributing this very partial success to the fact that the measures recommended have never been universally, nor indeed very thoroughly, carried out.

Special importance is attributed to three points :—

(1) During attack all failing shoots should be pulled out and burnt.
(2) Haulm should not be allowed to stand after November.
(3) Care should be taken to burn the haulm completely. It is even advisable to dry it before burning, since living *puparia* are often to be found in half-charred stems.

The chief danger is to young shoots, two or three years old. In an established bed it is these shoots, which are unmarketable, and allowed to grow up, which perpetuate the attack. Moreover, it is the young shoots which are preferred by the fly for egg-laying. Older heads are harvested, and any incipient attack upon them can come to nothing. Dingler is of opinion that if all young plants could be protected the problem would be solved. If, therefore, a grower has reason to believe that the fly is present on his land, it behoves him to pay special attention to the beds of young plants. Something can be done by collecting the flies in the early morning with a sweeping net, or by killing them with a contact insecticide, such as nicotine dust. In the badly infested districts near Paris it is even customary for the young shoots to be protected by paper or " cellophane " guards, some of the heads being left exposed as traps for the fly and later pulled out and burnt. Another expedient is to use " shelter " plants, for it is found that asparagus heads surrounded by foliage are much less subject to attack. Dwarf beans grown between asparagus rows are excellent for this purpose, and incidentally they enrich the soil. These suggestions concern the large-scale grower or the owner of a garden in which an asparagus bed has been newly laid out in a district where the fly is known to be present. In the case of an old-established bed it is advisable to prolong the harvesting to the end of the fly season, and to pull out and destroy shoots that show signs of failure.

One other measure advocated abroad is surely unique in the treatment of injurious insects. It is stated that the fly, in laying its eggs, is more attracted by the shape of the shoot than by its smell, and may be induced to oviposit on wooden pegs more or less resembling asparagus shoots. Such pegs, smeared with adhesive matter, are placed in young asparagus beds as decoys, and the eggs laid on them of course do not develop.

How is the grower to recognize the presence of the disease ? If it has proceeded far the matter will be clear enough, for there is no other pest which works such havoc in an asparagus bed, but it is most important to note the beginning of the attack. If any of the young shoots show signs of dying, and especially of distorted growth, they should be pulled out and examined. In such shoots, if the fly is the cause of failure, the stem will be found to be tunnelled by some boring creature, and if the examination is made in June or July, maggots will be found at work. At a later date no maggots will be present, but brown *puparia*, or fly-cases, will probably be found near the bottom of the stalk.

FRUIT CROPS.

Most of the usual fruit pests were reported from one district or another, but on the whole loss from insect attack was not great. The occurrence of the wood leopard moth, *Zeuzera pyrina*, in many orchards was a notable feature, and seemed to indicate that this pest was on the increase.

The Codling moth was much less prevalent than in 1935, and Petherbridge and Thomas, who were devoting special attention to this pest at Cambridge, did not find the usual abundance of material to work upon, but were able to record some useful observations. It has generally been thought that, in favourable weather, the moth produces a second brood, but this seems doubtful. Moths of the first brood, of which the first examples appeared about June 9th, were found still on the wing in August, so that the flight period is longer than was recognized, and caterpillars, which were regarded as a second brood, may well arise from the eggs of these late members of the first brood.

MISCELLANEOUS NOTES.

The Honourable Company of Leathersellers earned the gratitude of all agriculturists by the intensive campaign against warble-fly which they set up some years ago, and the Order of the Minister of Agriculture and Fisheries for the compulsory treatment of infested cattle must be a source of great satisfaction to the Company. The Committee set up by the Leathersellers' Company represented a great variety of interests, and I served on it as one of the representatives of the Royal Agricultural Society. The results of experiments carried out under its direction showed that the best and cheapest method of combating the pest was by dressing the warbles with a derris ointment, and a great amount of propaganda work, chiefly through County Councils, explained by leaflets and demonstrations the precise method of dealing with the disease. The Leathersellers' Company is to be congratulated heartily on the successful issue of its campaign.

The blister beetle or "Spanish fly," *Lytta vesicatoria*, is a rare insect in this country, occasionally met with on privet by the wayside. It is not regarded as a pest and certainly finds no place in the list of insects injurious to forest trees. It was surprising, therefore, to note that in June last it occurred in large numbers in one locality in Cambridgeshire and actually succeeded in defoliating some ash trees. The matter is the more remarkable in that the beetle is one of a group possessing larvæ of parasitic habit, generally living in the nests of other insects, such as bees, and it is difficult to understand how such large numbers could occur in a limited area. It is very unlikely that there will be any recurrence of the phenomenon, but so curious a case should not pass unrecorded.

CECIL WARBURTON.

School of Agriculture,
Cambridge.

HILLS BEQUEST.

REPORT OF RESEARCH WORK, 1934–36.

THE EFFECT OF SALTS OF LITHIUM ON THE RESISTANCE OF CERTAIN PLANTS TO DISEASE.

Introduction.—Work under the Hills Bequest during the past two years has consisted in an investigation of the effects of the salts of lithium on the susceptibility of wheat to brown rust (*Puccinia triticina*, Erikss.) and mildew (*Erysiphe graminis*, D.C.), and of lettuce to ring spot (*Marssonina panattoniana*, Berl.). The present paper concerns the soil culture experiments only, and is a general account of the methods used and a preliminary statement of the results obtained. Full details of this work and also of the subsequent cytological work will appear at a later date.

In the course of pot-culture experiments at Woburn, extending from 1898 to 1911, Voelcker (Ref. 1) showed that lithium salts are toxic to wheat, barley, etc., when they are present in concentrations which give 0·003 per cent. or more of lithium in the soil, but that, in concentrations not exceeding 0·002 per cent., they stimulate the growth of wheat and promote an increased yield.

Spinks (Ref. 2) observed that wheat which had been treated with amounts of lithium salts sufficient to give from 0·003 to 0·001 per cent. lithium in the soil was very much less affected by mildew than untreated wheat. The phosphate, nitrate and carbonate were equally effective, and the degree of immunity was increased by increase in the amount of lithium salt supplied.

General consideration of Methods.—Investigations on disease resistance involve not only the culture of the host plant but also that of the disease-producing organism. Where the latter is a acultative parasite it can be grown on a suitable culture medium and under appropriate environmental conditions quite independently of the host plant and of external weather conditions;

but with an obligate parasite the host plant itself is the only possible culture medium. In the latter case the environmental conditions must be adjusted in such a way as to suit both the host plant and the parasite.

When testing plants for differences in their powers of resistance to a particular disease, it is clearly important to maintain, so far as possible, the optimum conditions for the development of that disease. These conditions may occur, in nature, perhaps once or twice a year and so favour an epidemic of the disease, but it is no easy matter to reproduce them in an ordinary greenhouse continuously and throughout the year. In fact it is usually impossible in a greenhouse to rule out altogether the effects of the external weather conditions, and it is generally necessary to adjust those factors, such as temperature, which are under some degree of control, in such a way as to give the best possible results in combination with the uncontrolled factors.

In the case of fungi such as the cereal rusts, which under natural conditions appear during the summer months, the reduced amount of light when they are cultured under ordinary greenhouse conditions during the winter causes a marked decrease in their vigour of growth. A further complication is introduced by the fact that the parasite may require for its complete development on the host plant not a *constant* set of environmental conditions but a definite *succession* of such conditions. For example, germination of the spores and infection of the host may be favoured by a high relative humidity, while the subsequent development of the fungus may be favoured by a lower relative humidity.

The methods adopted and the results obtained in the experiments on each of the three diseases studied will now be described in turn.

BROWN RUST OF WHEAT.

Methods.—Red Marvel wheat, which is susceptible to this rust, was grown in a poor potting soil, ordinary 4-inch pots being used and nine seeds being sown in each pot. When the seedlings had appeared some of the pots received solutions of lithium salts while others were kept as controls and received water only. The seedlings were then tested for rust resistance by inoculating all alike with rust spores and afterwards noting the degree of infection.

The following six lithium compounds were tested at the concentrations given :—

Lithium nitrate ($LiNO_3$) .	1%	2·5%	5%
„ chloride ($LiCl$) .	1%	2·5%	5%
„ sulphate (Li_2SO_4) .	1%	2·5%	5%
„ oxide (Li_2O) .	1%	2%	4%
„ carbonate (Li_2CO_3) .	0·75%	—	—
„ phosphate (Li_3PO_4) .	0·02%	—	—

For purposes of comparison a few sets of plants were treated with the corresponding salts of potassium at concentrations of 1 per cent., 2·5 per cent., and 5 per cent. in each case.

The solutions were watered on to the soil by means of a pipette, usually when the seedlings had reached the one- to two-leaf stage, *i.e.*, from two to three weeks after sowing. They were usually applied in doses of 10 c.c. per pot, control pots receiving the same number of doses of rain water.

Each seedling was inoculated on the first leaf with rust spores, usually one day after the application of the solutions. The fresh growth above the first leaf was cut off from time to time for greater convenience in handling. Several methods of inoculation were tried, but it was found most satisfactory to make a suspension of the spores and then to spread drops of this suspension on the lower surface of the leaves by means of a bone spatula. At first water was used for making the suspension, but in the later trials a more satisfactory suspension was obtained by substituting a 0·4 per cent. solution of gelatine. The spores were then added at the rate of 0·02 gramme of spore material to 50 c.c. of 0·4 per cent. gelatine.

After inoculation the plants were kept in a saturated atmosphere in a zinc glass-topped incubator for two days, in order to provide favourable conditions for the germination of the spores. They were then placed on the greenhouse bench and watered regularly.

Observations were made on the number of infections, the size of the mature pustules, and the length of time taken for the pustules to appear. The condition of the plants was also noted. The numbers of infections were counted from two to three weeks after inoculation, and the plants were then thrown out.

Observations and Conclusions.—In no case was there any indication of a high degree of resistance to rust as a result of treatment with a lithium salt. Counts of the number of infections per leaf, however, indicated a definite decrease in susceptibility in those plants which had been treated with 5 per cent. lithium chloride, and a slight decrease in those treated with 2·5 per cent. and 5 per cent. lithium nitrate, 1 per cent. and 2·5 per cent. lithium chloride, and 2 per cent. lithium oxide. In no case was there any indication of increased susceptibility.

Four per cent. lithium oxide was fatal to many of the seedlings so treated, and, in general, treatment with lithium solutions of higher concentration than 1 per cent. tended to weaken the plants slightly and caused the leaves to wither sooner.

All the lithium treatments caused a reduction in the average size of the mature rust pustules, this effect being greatest in the case of 5 per cent. lithium nitrate.

The rate of development of the pustules was not materially affected by treatment of the plants with lithium salts.

The parallel tests with potassium salts showed, in contrast to the lithium treatments, no definite decrease in susceptibility. In fact the average number of infections per leaf tended to be increased slightly, except in the case of potassium phosphate, where the value was close to that given by the control plants. On the other hand, the average size of the pustules was slightly reduced in most cases, but this effect was less marked than after treatment with lithium.

MILDEW OF WHEAT.

Methods.—Red Marvel and Rivet wheats, which are both susceptible to mildew, were grown in pots as described above. The same lithium salts were used, and the solutions were applied in a similar manner when the seedlings had reached the one- to two-leaf stage.

Once the mildew had become well established in the greenhouse, artificial inoculation of the plants was unnecessary, satisfactory results being obtained under conditions of natural infection. The plants were not placed in the incubator at any stage, but were kept on the greenhouse bench and watered regularly. As before, the fresh growth above the first leaf was cut off from time to time to facilitate handling.

The observations, which were based on the first leaf of each seedling, were made about three weeks after the application of the solutions, the plants being then about thirty days old. The number of diseased plants and the number of healthy plants under each treatment were recorded, and the former were classified by eye into three or four classes according to the proportion of leaf area covered with mildew.

Observations and Conclusions.—Table I shows the mean number of diseased plants, per batch of twenty-eight, after treatment with 10 c.c. of a variety of lithium salts at concentrations ranging from 0·1 to 5 per cent.

TABLE I.

Effect of Lithium Salts on the Mean Number of Mildewed Wheat Plants per batch of twenty-eight.

Treatment.	Red Marvel.	Cambridge Rivet.
Control	27·2	22·6
Lithium nitrate, 0·1% . .	26·7	20·6
,, ,, 1% . . .	25·6	16·7
,, ,, 2·5% . .	18·9	11·9
,, ,, 5% . . .	7·8	9·1
,, chloride, 1% . . .	23·1	—
,, ,, 2·5% . .	12·9	—
,, ,, 5% . . .	5·0	—
,, sulphate, 1% . . .	23·3	—
,, ,, 2·5% . .	19·0	—
,, ,, 5% . . .	12·8	—
,, oxide, 1% . . .	21·7	—
,, ,, 2% . . .	19·9	—

It is clear that susceptibility to mildew is reduced by treatment with lithium salts and that the effect increases with increase in the amount of lithium salt supplied. The effect is actually much more marked than these figures indicate because the intensity of attack by mildew on diseased plants which have been treated with lithium is, in general, considerably less than that on diseased control plants.

Further experiments confirm that, of the salts tested, lithium chloride is the most effective in checking mildew. Furthermore it appears that a given amount of a lithium salt applied at a low concentration is less deleterious to the plants than the same amount at a higher concentration, although its effect on susceptibility to mildew is not reduced.

As the plants grow to maturity, there is, in many cases, apparently complete recovery from the ill-effects due to lithium which were noted during the seedling stage, although at least some degree of resistance to mildew is maintained.

RING SPOT OF LETTUCE.

Methods.—"All-the-Year-Round" was found to be a suitable variety of lettuce for use in the experiments on resistance to ring spot. The seeds were sown in ordinary potting soil in wooden boxes which were kept in an unheated greenhouse during the winter and in the open air during the summer, because attack by *Marssonina* is favoured by a rather low temperature.

Marssonina is a facultative parasite, but, although vegetative growth is satisfactory in culture, it is difficult to induce spore production under these conditions. When spores were not available infection was carried out by means of an extract of infected lettuce tissue.

Solutions of lithium nitrate and lithium sulphate were used, the concentrations ranging from 0·5 to 5 per cent. In the earlier experiments they were applied by means of a pipette, along the sides of the rows, from six to eight weeks after sowing, 10 c.c. of solution being allowed to each row. Control boxes received water only. On the following day the plants were infected with *Marssonina* by spraying them with an extract of infected tissue or with a suspension of spores from a pure culture.

During the winter growth was slow and it was found advisable to keep the soil rather dry in order to discourage the growth of moulds.

In the later experiments infection by *Marssonina* was brought about by infection of the soil previous to sowing. Diseased lettuce leaves were minced and shaken up with water. The suspension was divided into equal parts, which were suitably diluted and poured over the soil in the boxes. The soil in each box was then well mixed. Lettuce seeds were sown on the following day, fifteen to twenty seeds being sown per row and five rows per box; 100 c.c. of the appropriate lithium solution was sprayed on to the soil in the boxes, by means of a syringe, as soon as possible after sowing. The control boxes received water only.

The plants were harvested and examined when about four weeks old in the case of the soil infection experiments, and about two or three weeks after treatment where infection was carried out by spraying the plants. The number of diseased plants and the number of healthy plants under each treatment were recorded, and the former were classified by eye into three groups according to the degree to which they were attacked by the fungus. It was rarely possible to count the number of lesions present. The part of the plant attacked was noted, whether the stem only, the leaf only, or both. In one of the major experiments the dry weight yields from each box were determined.

Observations and Conclusions.—Soil infection was found to give rather more reliable results than infection by spraying, although it is clear from all the experiments that lithium nitrate at concentrations of 2·5 per cent. or above caused a decrease in the amount of ring spot. At the same time the seedlings were adversely affected at these concentrations.

Table II shows the results of a large-scale soil infection experiment. Ten boxes of lettuce were assigned to each treatment, seventy-five seeds being sown in each box. Each box received 100 c.c. of the appropriate lithium solution. The values for "amount of disease" were obtained from a classification of the plants by eye into three groups according to the extent of the fungal attack.

TABLE II.

Effect of Lithium Nitrate on the Susceptibility of Lettuce to Ring Spot (Marssonina panattoniana, *Berl*).

Treatment.	*Number of plants harvested.*	*Per-centage diseased.*	*Amount of disease per 500 plants.*	*Dry weight. (grams.)*	*Dry weight per 500 plants. (grams.)*
Control . . .	584	21	157	65·2	55·8
Lithium nitrate, 0·5% .	604	20	142	64·9	53·7
" " 1% .	583	13	87	67·6	58·0
" " 2·5% .	471	7	49	41·7	44·3

There is a marked reduction in the amount of disease with increasing concentration of lithium nitrate. The 2·5 per cent. solution caused a reduction in germination and growth rate of the lettuce and necrosis of the tips of the leaves, but the application of a 1 per cent. solution clearly reduced the amount of ring spot without affecting the plants adversely.

GENERAL CONCLUSION.

It is clear from this preliminary statement of the results obtained that the application of lithium salts under the rather narrowly circumscribed conditions of the experiments has a very definite effect in reducing the susceptibility of certain plants to disease.

I should like to record my thanks to Professor Sir Rowland H. Biffen for his unfailing encouragement and helpful criticism during the course of this work, and also to Dr. R. M. Woodman for his valuable help and advice.

W. R. S. WORTLEY.

School of Agriculture,
Cambridge.

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	Monmouthshire .	78	1	Sir L. Foster Stedman.
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	Northamptonshire .	166	1	F. H. Thornton.
	Northumberland .	264	2	William Robertson; C. H. Sample.
	Staffordshire . .	189	1	Major R. A. Dyott.
	Worcestershire .	127	1	John Walker.
	Yorkshire, N.R. .	205	1	Major Gordon B. Foster.
	Scotland . . .	294	2	Earl of Elgin; James Kilpatrick.
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	Essex . . .	217	1	Sir Walter Gilbey, Bart.
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	Rutland . . .	43	1	Capt. W. J. Baird.
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	Suffolk . . .	307	2	Major Norman Everett; Fred Smith.
	Surrey . . .	189	1	R. Borlase Matthews.
	Wiltshire . .	152	1	Earl of Radnor.
	Yorkshire, W.R. .	262	1	C. W. H. Glossop.
	South Wales . .	72	1	Capt. H. A. Christy.
		—2,802	— 17	
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	Glamorgan . .	47	1	Hubert Alexander.
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Year.	President of the Year.	Governors.		Members.			Total.
		Life.	Annual.	Life.	Annual.	Honorary.	
1839	3rd Earl Spencer	—	—	—	—	—	1,100
1840	5th Duke of Richmond	86	189	146	2,434	5	2,860
1841	Mr. Philip Pusey	91	219	231	4,047	7	4,595
1842	Mr. Henry Handley	101	211	328	5,194	15	5,849
1843	4th Earl of Hardwicke	94	209	429	6,155	15	6,902
1844	3rd Earl Spencer	95	214	442	6,161	15	6,927
1845	5th Duke of Richmond	94	198	527	5,899	15	6,733
1846	1st Viscount Portman	92	201	554	6,105	19	6,971
1847	6th Earl of Egmont	91	195	607	5,478	20	6,391
1848	2nd Earl of Yarborough	93	186	648	5,387	21	6,335
1849	3rd Earl of Chichester	89	178	582	4,643	20	5,512
1850	4th Marquis of Downshire	90	169	627	4,356	19	5,261
1851	5th Duke of Richmond	91	162	674	4,175	19	5,121
1852	2nd Earl of Ducie	93	156	711	4,002	19	4,981
1853	2nd Lord Ashburton	90	147	739	3,928	19	4,923
1854	Mr. Philip Pusey	88	146	771	4,152	20	5,177
1855	Mr. William Miles, M.P.	89	141	795	3,838	19	4,882
1856	1st Viscount Portman	85	139	839	3,896	20	4,979
1857	Viscount Ossington	83	137	896	3,933	19	5,068
1858	6th Lord Berners	81	133	904	4,010	18	5,146
1859	7th Duke of Marlborough	78	130	927	4,008	18	5,161
1860	5th Lord Walsingham	72	119	927	4,047	18	5,183
1861	3rd Earl of Powis	84	90	1,113	3,328	18	4,633
1862	H.R.H. The Prince Consort 1st Viscount Portman	83	97	1,151	3,475	17	4,823
1863	Viscount Eversley	80	88	1,263	3,735	17	5,183
1864	2nd Lord Feversham	78	45	1,343	4,013	17	5,496
1865	Sir E. C. Kerrison, Bart., M.P.	79	81	1,386	4,190	16	5,752
1866	1st Lord Tredegar	79	84	1,395	4,049	15	5,622
1867	Mr. H. S. Thompson	77	82	1,388	3,903	15	5,465
1868	6th Duke of Richmond	75	74	1,409	3,888	15	5,461
1869	H.R.H. The Prince of Wales, K.G.	75	73	1,417	3,864	17	5,446
1870	7th Duke of Devonshire	74	74	1,511	3,764	15	5,436
1871	6th Lord Vernon	72	74	1,589	3,896	17	5,648
1872	Sir W. W. Wynn, Bart., M.P.	71	73	1,655	3,953	14	5,768
1873	3rd Earl Cathcart	74	62	1,832	3,936	12	5,916
1874	Mr. Edward Holland	76	58	1,944	3,756	12	5,846
1875	1st Viscount Bridport	79	79	2,058	3,918	11	6,145
1876	2nd Lord Chesham	83	78	2,164	4,013	11	6,349
1877	Lord Skelmersdale	81	76	2,239	4,073	17	6,486
1878	Col. Kingscote, C.B., M.P.	81	72	2,328	4,130	26	6,637
1879	H.R.H. The Prince of Wales, K.G.	81	72	2,453	4,700	26	7,332
1880	9th Duke of Bedford	83	70	2,673	5,083	20	7,929
1881	Mr. William Wells	85	69	2,765	5,041	19	7,979
1882	Mr. John Dent Dent	82	71	2,849	5,059	19	8,080
1883	6th Duke of Richmond and Gordon	78	71	2,979	4,952	19	8,099
1884	Sir Brandreth Gibbs	72	72	3,203	5,408	21	8,776
1885	Sir Massey Lopes, Bart., M.P.	71	69	3,356	5,619	20	9,135
1886	H.R.H. The Prince of Wales, K.G.	70	61	3,414	5,569	20	9,134
1887	2nd Lord Egerton of Tatton	71	64	3,440	5,387	20	8,982
1888	Sir M. W. Ridley, Bart., M.P.	66	56	3,521	5,225	16	8,884
1889	HER MAJESTY QUEEN VICTORIA	73	58	3,567	7,153	15	10,866
1890	Lord Moreton	122	58	3,846	6,941	17	10,984
1891	2nd Earl of Ravensworth	117	60	3,811	6,921	19	10,928
1892	1st Earl of Feversham	111	69	3,784	7,066	20	11,050
1893	1st Duke of Westminster, K.G.	107	74	3,786	7,138	21	11,126
1894	8th Duke of Devonshire, K.G.	113	73	3,798	7,212	22	11,218
1895	Sir J. H. Thorold, Bart.	120	80	3,747	7,179	23	11,149
1896	Sir Walter Gilbey, Bart.	126	83	3,695	7,253	23	11,180
1897	H.R.H. The Duke of York, K.G.	126	83	3,705	7,285	24	11,223
1898	5th Earl Spencer, K.G.	121	79	3,687	7,182	25	11,094
1899	9th Earl of Coventry	116	75	3,656	7,009	23	10,879
1900	H.R.H. The Prince of Wales, K.G.	111	71	3,628	6,832	24	10,666
1901	3rd Earl Cawdor	102	70	3,564	6,338	27	10,033
1902	H.R.H. Prince Christian, K.G.	100	69	3,500	5,955	26	9,650
1903	H.R.H. The Prince of Wales, K.G.	99	62	3,439	5,771	27	9,398
1904	16th Earl of Derby, K.G.	96	68	3,375	5,906	32	9,477

TABLE SHOWING THE NUMBER OF GOVERNORS AND MEMBERS IN EACH YEAR FROM THE ESTABLISHMENT OF THE SOCIETY—*contd.*

Year.	President of the Year.	Governors		Members.			Total.
		Life.	Annual.	Life.	Annual.	Honorary.	
1905	9th Lord Middleton . . .	89	78	3,212	5,758	33	9,170
1906	Mr. F. S. W. Cornwallis . . .	94	155	3,132	6,189	30	9,600
1907	Earl of Yarborough . . .	91	174	3,076	6,299	29	9,669
1908	Duke of Devonshire, K.G. . .	89	178	3,019	6,442	30	9,758
1909	7th Earl of Jersey, G.C.B. . .	91	177	2,951	6,696	31	9,946
1910	Sir Gilbert Greenall, Bart. . .	86	166	2,878	6,934	31	10,095
1911	HIS MAJESTY KING GEORGE V. .	85	168	2,805	7,191	30	10,279
1912	9th Lord Middleton . . .	85	170	2,741	7,283	30	10,309
1913	2nd Earl of Northbrook . . .	89	168	2,691	7,474	26	10,448
1914	Earl of Powis	89	173	2,626	7,629	28	10,545
1915	Duke of Portland, K.G. . [K.G.	88	184	2,517	7,313	28	10,130
1916	7th Duke of Richmond and Gordon,	83	185	2,427	7,526	27	10,248
1917	Mr. Charles Adeane, C.B. . .	93	210	2,412	8,214	26	10,955
1918	Hon. Cecil T. Parker . . .	102	224	2,395	8,226	25	10,972
1919	Sir J. B. Bowen-Jones, Bart. . .	119	236	2,411	8,558	24	11,348
1920	H.R.H. The Prince of Wales, K.G. .	129	256	2,402	9,208	25	12,020
1921	Mr. R. M. Greaves . . .	137	275	2,374	10,098	24	12,908
1922	H.R.H. The Duke of York, K.G. .	144	287	2,317	10,596	22	13,366
1923	Lt.-Col. E. W. Stanyforth . .	153	293	2,262	10,778	20	13,506
1924	Mr. Ernest Mathews, C.V.O. . .	159	289	2,201	10,676	21	13,346
1925	Sir Gilbert Greenall, Bart, C.V.O. .	158	291	2,160	10,949	15	13,573
1926	Lord Desborough, G.C.V.O. . .	155	276	2,103	10,251	15	12,800
1927	1st Viscount Tredegar, C.B E. . .	153	257	2,035	9,343	15	11,803
1928	Lord Harlech, C.B. . . .	155	277	1,972	9,042	16	11,462
1929	Earl of Harewood, K.G. . .	154	273	1,914	8,813	16	11,170
1930	H.R.H. The Duke of Gloucester, K.G.	158	264	1,882	8,491	16	10,811
1931	Sir Arthur Hazlerigg, Bart. . .	153	245	1,823	8,036	16	10,273
1932	Lord Mildmay of Flete . . .	144	223	1,774	7,501	13	9,655
1933	Duke of Devonshire, K.G. . .	140	212	1,707	7,367	13	9,439
1934	Earl of Stradbroke, K.C.M.G. . .	140	205	1,666	7,141	17	9,169
1935	H.R.H. The Duke of Kent, K.G. .	142	201	1,614	7,029	18	9,004
1936	Sir Merrik R. Burrell, Bt., C.B.E.	140	196	1,588	7,027	17	8,968

STATEMENT made to the Council by the Chairman of the Finance Committee, on presenting the Accounts for the year 1935.

Mr. ADEANE said that he had pleasure in submitting the Accounts and Balance Sheet for the year 1935. The Society began the year with a balance of £3,454; the receipts for 1935 amounted to £18,834, giving a total of £22,288. On the expenditure side, the total payments amounted to £18,709. As there was a surplus on the Newcastle Show, the £3,500 which was provided in the estimates against a Show loss was not required, and was invested, together with £1,714. Those sums were included in the total payments. The balance carried forward at the end of the year was £3,579.

With regard to the Balance Sheet, on the Debtor side of the Account it would be seen that from the surplus of £6,505 on the Newcastle Show £1,950 had been deducted. This was the amount of the grant made by the Society to the Local Committee at Newcastle. For the first time for some years it was necessary to record a depreciation in the market value of the Society's investments. At the end of the year this depreciation amounted to £5,377. The new money invested during the year was £9,998. The Reserve Fund investments now stood at £236,292, compared with £231,671 at December 31st, 1934.

Figures for 1934 £	Receipts.	£	s.	d.	£	s.	d.	£	s.	d.
	CASH AT BANKERS AND IN HAND, JANUARY 1, 1935 :—									
79	Reserve Fund Account				43	19	0			
3,569	Current Account				3,200	15	5			
180	Petty Cash at Bank and in Hand				209	14	8			
3,828								3,454	9	1
	SUBSCRIPTIONS :—									
1,122	Annual Governors	1,139	5	0						
7,333	Annual Members	7,157	3	11						
32	Life Governors and Members	42	7	0						
58	For previous years	68	7	0						
8,545					8,407	2	11			
	JOURNAL OF THE SOCIETY :—									
272	Advertisements	256	18	11						
129	Sales and Reprints	122	17	7						
401					379	16	6			
	EXAMINATIONS :—									
493	National Diploma in Agriculture	517	3	10						
400	National Diploma in Dairying	357	3	11						
893					874	7	9			
	MISCELLANEOUS :—									
6,748	Interest on Investments	7,159	16	11						
189	Income Tax refunded	357	2	7						
47	Bank Interest	50	15	6						
37	Sales of Pamphlets, etc.	21	19	10						
201	Sales of Text Book	134	16	4						
33	Hire of Rooms	36	15	0						
105	Donations to Society's Funds	106	6	4						
100	Argentine Rural Society	100	0	0						
152	Park Royal Drainage Rate	135	13	5						
248	Rent, 12, Hanover Square	255	15	0						
7,860					8,359	0	11			
17,699	TOTAL OF ORDINARY RECEIPTS							18,020	8	1
465	Life Compositions of Governors and Members				548	0	0			
117	Subscriptions for 1936 and 1937				134	12	0			
—	Legacy for research *re* Foot and Mouth Disease				100	0	0			
3	Show Account (postage, Dec., 1934)				0	19	1			
5	Argentine Rural Society				30	0	0			
590								813	11	1
£22,117								£22,288	8	3

PAYMENTS FOR THE YEAR 1935.

Figures for 1934 £	Payments.	£	s.	d.	£	s.	d.	£	s.	d.
	GENERAL ADMINISTRATION :—									
4,090	Salaries and Wages	4,112	8	8						
359	Pensions	383	19	5						
242	Legal Charges and Auditors' Fees	257	0	2						
1,002	Rent, Rates, Insurance and House Expenses	1,020	10	5						
357	Printing and Stationery	447	11	4						
306	Postage, Telephone and Sundries	390	13	7						
6,356					6,612	3	7			
	JOURNAL OF THE SOCIETY :—									
1,358	Volume 95	1,438	15	2						
26	*Re* Volume 96, etc.	62	11	3						
1,384					1,501	6	5			
	SCIENTIFIC DEPARTMENTS :—									
410	Chemist's Salary and Petty Cash	410	12	11						
250	Botanist's Salary	250	0	0						
200	Zoologist's Salary	200	0	0						
400	Grant to Royal Veterinary College	400	0	0						
50	Grant to Research Institute, Reading	50	0	0						
2	Medal *re* Cattle Pathology	2	13	3						
1,312					1,313	6	2			
	EXAMINATIONS :—									
602	National Diploma in Agriculture	601	1	11						
534	National Diploma in Dairying	468	14	3						
1,136					1,069	16	2			
	MISCELLANEOUS :—									
1,474	Grant to Research Fund	1,625	0	0						
21	Library: Books, etc.	31	2	9						
25	Repairs to House and Furniture	141	13	10						
4	Medals, etc., for Long Service	20	0	3						
101	"Elements of Agriculture," new edition	100	0	0						
86	*Dinner to Secretaries of Breed Societies*	—								
—	Donation to Royal Agricultural Benevolent Institution	250	0	0						
—	Donation to Home Sugar Beet Defence Committee	50	0	0						
520	*Donations to Rothamsted Experimental Station and another*	—								
81	Gold Medal; design, dies, etc.	31	4	9						
100	Argentine Rural Society	100	0	0						
314	Park Royal Drainage Rate	291	2	10						
248	Rent, 12, Hanover Square	255	15	0						
3,500	Amount set aside towards Loss on Shows (to Invested Reserve Fund)	3,500	0	0						
6,474					6,395	19	5			
16,662	TOTAL OF ORDINARY PAYMENTS							16,892	11	9
—	Agricultural Research Council: Legacy for research *re* Foot & Mouth Disease				100	0	0			
1	Show Account: (Postage, Dec., 1935)				2	4	3			
2,000	On Account of Investments purchased (ex Ordinary and Reserve Accounts)				1,714	8	10			
2,001								1,816	13	1
	CASH AT BANKERS AND IN HAND, DECEMBER 31, 1935 :—									
44	Reserve Fund Account				148	0	0			
3,201	Current Account				3,241	2	11			
209	Petty Cash at Bank and in Hand				190	0	6			
3,454								3,579	3	5
£22,117								£22,288	8	3

Examined, audited and found correct,
PRICE, WATERHOUSE & CO.,
Chartered Accountants,
Accountants and Auditors.

3 FREDERICK'S PLACE,
OLD JEWRY, LONDON, E.C.2.
25th February, 1936.

BALANCE SHEET,

Figures for 1934 £		£	s.	d.	£	s.	d.	£	s.	d.
	CAPITAL AND RESERVE FUND—									
208,620	As at December 31, 1934 . . .				239,553	15	2			
	SHOW FUND—									
8,229	Surplus on Newcastle-upon-Tyne Show	6,505	14	2						
—	*Less*: grant to Local Committee .	1,950	0	0						
		4,555	14	2						
3,500	*Add*: Contribution from Ordinary Account	3,500	0	0						
11,729					8,055	14	2			
220,349					247,609	9	4			
	RECEIPTS AND PAYMENTS ACCOUNT—									
	Ordinary Receipts. . . .	18,020	8	1						
	Ordinary Payments . . .	16,892	11	9						
1,037					1,127	16	4			
465	Life Compositions received in 1935 .				548	0	0			
163	Subscriptions for 1935 received in 1934.				117	2	0			
222,014					249,402	7	8			
(*Add*) 17,584	*Less*: Depreciation in market values of Investments				5,377	10	0			
239,598					244,024	17	8			
339	*Add*: Adjustment *re* outstanding Assets and Liabilities . . .				217	10	6			
239,937					244,242	8	2			
	DEPRECIATION written off, viz.:—									
38	Furniture, Fittings, etc. . .	34	11	9						
246	Show Plant	221	1	2						
100	Lease of 16 Bedford Square . .	100	0	0						
384					355	12	11			
239,553								243,886	15	3
	SUNDRY CREDITORS—									
2,124	Sundry Accounts owing. . .				2,025	1	9			
117	Subscriptions for 1936 and 1937 received in 1935				134	12	0			
2,241								2,159	13	9
£241,794								£246,046	9	0

NOTE—There are commitments in respect of Contracts entered into in connexion with the forthcoming Show.

T. B. TURNER,
Secretary.

SOCIETY OF ENGLAND.
DECEMBER 31, 1935.

Figures for 1934 £		£	s.	d.	£	s.	d.
	RESERVE FUND INVESTMENTS AT MARKET PRICES ON DECEMBER 31, 1935:—						
171,616	£154,609 4*s*. 11*d*. Conversion Loan 3½% (1961) @ 107¾	160,591	9	4			
3,802	£3,909 16*s*. Local Loans 3% (1912) @ 96½	3,772	19	2			
2,997	£2,840 13*s*. 6*d*. Metropolitan 3% Consolidated Stock (1941) @ 105½	2,996	18	3			
6,985	£6,528 1*s*. 6*d*. Dominion of Canada 4% Stock (1940–60) @ 104	6,789	4	0			
2,752	£2,724 11*s*. 7*d*. Metropolitan Water 3% (E) Stock (1953–73) @ 101	2,751	16	6			
13,458	£12,234 12*s*. 5*d*. Commonwealth of Australia 4% Stock (1955–70) @ 109	13,335	14	9			
7,277	£6,800 14*s*. 2*d*. Union of S. Africa 3½% Stock (1953–73) @ 107	7,276	15	2			
7,345	£6,500 Dominion of Canada 4% Stock (1953–58) @ 111	7,215	0	0			
11,940	£11,371 18*s*. Commonwealth of Australia 3¾% Stock (1946–49) @ 104	11,826	15	6			
3,499	£3,430 Central Electricity Board 3½% Stock (1963–93) @ 105	3,601	10	0			
—	£4,719 London, Midland & Scottish Rly. Co. 4% Debenture Stock @ 108	5,096	10	5			
—	£4,914 2*s*. 8*d*. Funding Loan 3% (1959–69) @ 102½	5,036	19	9			
231,671					236,291	12	10
	LEASE OF 16 BEDFORD SQUARE	200	0	0			
	Less Amount written off in 1935	100	0	0			
200					100	0	0
	FURNITURE, FITTINGS, FIXTURES, ETC.—						
	As at December 31, 1934	345	17	10			
	Less Depreciation @ 10%	34	11	9			
346					311	6	1
1,500	PICTURES (£500) and BOOKS (£1,000)				1,500	0	0
	SHOW PLANT—						
	As at December 31. 1934	2,210	11	6			
	Less Depreciation @ 10%	221	1	2			
2,210					1,989	10	4
1,093	EXPENDITURE (less amounts received) *re* BRISTOL SHOW				1,545	2	2
2,893	SUNDRY DEBTORS				403	10	6
237	RATES PAID IN ADVANCE AND INCOME TAX RECOVERABLE				309	7	6
	CASH AT BANKERS AND IN HAND—						
44	Reserve Fund Account	148	0	0			
229	Investment Account	1	15	3			
3,201	Current Account	3,241	2	11			
210	Petty Cash at Bank and in Hand	190	0	6			
3,684		3,580	18	8			
(*Less*) 2,040	Show Account	15	0	11			
1,644					3,595	19	7
£241,794					£246,046	9	0

3 FREDERICK'S PLACE,
OLD JEWRY, LONDON, E.C.2.
25th February, 1936.

Examined, audited and found correct,
PRICE, WATERHOUSE & CO.,
Chartered Accountants,
Accountants & Auditors.

Royal Agricultural Society of England.

STATEMENTS OF FUNDS HELD BY THE SOCIETY IN TRUST OR WHICH ARE NOT CONSIDERED AVAILABLE FOR GENERAL PURPOSES, DECEMBER 31, 1935.

E. H. HILLS' BEQUEST.

				£	*s.*	*d.*		£	*s.*	*d.*
To amount bequeathed for Pot-culture Experiments				9,000	0	0	By £7,222 15*s.* 0*d.* 3½% Conversion Loan Stock (1961) (purchased on sale of War Loan Stock) at cost	5,616	1	10
	£	*s.*	*d.*							
Less : Depreciation of Consols at time of conversion .	3,582	7	11				(*Value December* 31, 1935, at 107¾ = £7,782 10*s.* 3*d.*)			
„ Cost of conversion . .	134	14	7	3,717	2	6				
				5,282	17	6				
To surplus on sale of 5% War Loan Stock . .				333	4	4				
				£5,616	1	10		£5,616	1	10

QUEEN VICTORIA GIFTS FUND.

	£	*s.*	*d.*		£	*s.*	*d.*
To Fund originally invested (the income from this Fund is used to make Annual Grants to unsuccessful applicants for pension through the Royal Agricultural Benevolent Institution) .	5,000	0	0	By Investments in names of Trustees : at cost :			
Less : Loss on sales of stocks . . .	110	18	0	£1,045 19*s.* 3*d.* Dominion of Canada 3¼% Registered Stock, 1950–55	1,017	7	0
	4,889	2	0	£2,046 11*s.* 8*d.* Commonwealth of Australia 3½% Registered Stock, 1954–59	2,099	18	10
Undistributed income	109	10	1	£1,000 London Midland & Scottish Railway Consolidated 4% Guaranteed Stock . . .	1,556	15	9
				£190 4*s.* 6*d.* 2½% Consols	215	0	5
					4,889	2	0
				By Cash at Bank, December 31, 1935 . . .	109	10	1
	£4,998	12	1		£4,998	12	1

The market values of the Stocks on December 31, 1935, amounted to £4,369 8*s.* 1*d.*

STATEMENTS OF FUNDS HELD BY THE SOCIETY IN TRUST—*continued.*

GILBEY FUND.

	£	s.	d.
To Amount provided by the late Sir Walter Gilbey for endowment of Lectureship at Cambridge University	1,000	0	0
Accumulation of Interest	204	10	4
	£1,204	10	4

	£	s.	d.
By Investment at cost :—			
£1,457 5*s.* 2*d.* Metropolitan Water " A " Stock .	1,204	10	4
(*Value on December* 31, 1935, at 98=£1,428 2*s.* 3*d.*)			
	£1,204	10	4

SUPERANNUATION AND INSURANCE FUND.

	£	s.	d.	£	s.	d.
To amount set aside in accordance with declaration of Trust of July 26, 1911				9,171	5	0
Less : Depreciation and cost of conversion of Consols . .				2,094	1	4
				7,077	3	8
Purchase of 5% War Loan . .				1,167	0	0
Accumulation to Dec. 31, 1934 . .				1,672	8	4
				9,916	12	0
Income for 1935 . . .	356	0	5			
Contribution from Society . .	358	19	5			
Proceeds of Policy received . . .	709	6	0			
	1,424	5	10			
Matured Policy paid out, Premiums, Income Tax and Pension . .	1,341	2	6			
				83	3	4
				9,999	15	4
Income Tax on War Stock Interest				71	4	3
				£10,070	19	7

	£	s.	d.
By Investments in names of Trustees, at cost :—			
£9,028 0*s.* 7*d.* 3½% War Loan Stock (1952) . (converted from 5% Stock, July, 1932.)	8,453	7	8
£728 2*s.* 4*d.* West Australian 3½% Stock (1935–55)	559	17	4
£717 14*s.* 4*d.* Queensland 3½% Stock (1950–70) .	541	15	6
	9,555	0	6
By Cash at Bank, December 31, 1935 . . .	515	19	1
(NOTE.—The market values of the Stocks on Dec. 31, 1935, amounted to £11,030.)			
	£10,070	19	7

" MERCHANTS OF THE STAPLE OF ENGLAND " FUND.

	£	s.	d.
To capital sum paid by the " Merchants of the Staple of England " for the purpose of providing out of the yearly income Prizes to be competed for annually in the Wool Section of the Royal Show .	500	0	0

	£	s.	d.
By Investment at cost :—			
£503 1*s.* 9*d.* New South Wales Government 5% Inscribed Stock, 1935–55	500	0	0
(Value on Dec. 31, 1935, at 101½=£510 12*s.* 8*d.*)			

3 FREDERICK'S PLACE,
OLD JEWRY, LONDON, E.C.2.
25th February, 1936.

Examined, audited and found correct.
PRICE, WATERHOUSE & CO.,
Chartered Accountants,
Accountants & Auditors.

Royal Agricultural Society of England.

RESEARCH COMMITTEE.

RECEIPTS AND PAYMENTS FOR YEAR 1935.

RECEIPTS.	£	s.	d.
To Grant from General Account . . .	1,625	0	0
	£1,625	0	0

PAYMENTS.	£	s.	d.
By Grants to Research Institute in Animal Pathology, Royal Veterinary College, for Research *re* Mastitis in Cows . . .	300	0	0
„ Grants to Rothamsted Experimental Station for:—			
Lucerne Seed Inoculation Experiments .	50	0	0
Electricity on the Farm Investigation .	200	0	0
„ Grant to Norfolk Agricultural Station for Experiments *re* disposal of Beet Tops and Straw	300	0	0
„ Grant to Welsh Plant Breeding Station *re* Grass Seeds Mixture Trials . . .	105	0	0
„ Grant to Cambridge University Farm *re* Pig Feeding Experiments	150	0	0
„ Grant to Armstrong College *re* Tick Eradication from Sheep Grazings	100	0	0
„ Grant to East Malling Research Station *re* Walnut Culture	50	0	0
„ Editing, etc.	20	0	0
„ *Farmer's Guide to Agricultural Research in* 1934 :— Honoraria to Contributors . . .	350	0	0
	£1,625	0	0

STATEMENT made to the Council by the Chairman of the Finance Committee, on presenting the Accounts of the Bristol Show, 1936.

Mr. Adeane, in dealing with the Show accounts, said that the Council had the full details before them, and he did not suppose he need go into the figures in any detail. The loss on the Bristol Show must be entirely attributed to the weather. He did not suppose the Society had ever experienced such a continuously wet time since the Show at Kilburn in 1879, when the loss was £15,064. Under the circumstances the Society was extremely fortunate to get off with so small a loss as £1,667. The receipts at Bristol totalled £41,695, a decrease of £6,669 as compared with the Newcastle Show. This reduction was more than accounted for by the drop in the gate-money of £6,828. The expenditure amounted to £43,362, and showed an increase of £1,504 on the Newcastle figure. The cost of erection and maintenance of Showyard, including the extra cost of excavating post holes in the rock for the shedding, was £1,716 up on last year. It was the fourth visit of the Show to Bristol, where the Society had always received a warm welcome, and everything was done by the local bodies to make it agreeable. In many ways they were extremely fortunate, especially in the President, whose ability and hospitality had been much appreciated by them all. The visit of the Duke and Duchess of York was, as always, most welcome and gave the greatest pleasure to the Society. The Lord Mayor of Bristol did everything possible to make the Show a success and it was a rare honour to receive a visit from the Lord Mayor of London. They were much indebted to Mrs. Smyth, who generously placed a portion of her park at their disposal for a site.

He wished especially to mention the great help afforded by the Town Clerk of Bristol; Mr. T. R. Davy, the local Hon. Treasurer, and all those who helped the Society. Again he had the pleasure of expressing the thanks of the Council to the Honorary Director, who they were all glad to know would be President in the coming year, also to Mr. Turner, who had been so successful in arranging for an excellent exhibition on economic lines, and they must not forget the staff, whose assistance contributed so much to the success of the Show.

STATEMENT OF RECEIPTS AND EXPENDI-

JUNE 30 to

Figures for 1935 Show £	Receipts	£	s.	d.	£	s.	d.
2,500	Contribution from Bristol Local Committee to Show Fund . . .				2,000	0	0
	CONTRIBUTIONS TO PRIZE FUND :—						
2,600	Agricultural and Breed Societies and others	2,077	17	4			
—	Bristol Local Committee . . .	–	–	–			
2,600					2,077	17	4
—	Special Donation to Show . .				100	0	0
10,814	FEES FOR IMPLEMENTS, MACHINES AND MISCELLANEOUS EXHIBITS . . .				11,014	11	9
	FEES FOR ENTRY OF LIVE STOCK :—						
6,185	Members	6,577	16	0			
501	Non-members	849	7	6			
6,686					7,427	3	6
183	FEES FOR ENTRY OF POULTRY AND EGGS				181	13	0
	OTHER ENTRY FEES :—						
104	Produce	143	16	0			
90	Horse-jumping Competitions . .	156	0	0			
28	Plantations Competition . . .	31	2	0			
36	Butter-making Competitions . .	46	15	0			
258					377	13	0
	CATALOGUE :—						
857	Advertising in Catalogue and extra lines	774	1	11			
960	Sales of Catalogue	731	4	9			
51	Sales of Daily Programmes . .	48	7	0			
1,868					1,553	13	8
	ADMISSIONS TO SHOWYARD :—						
1,280	Tuesday, June 30, @ 5*s*.	988	16	6			
4,753	Wednesday, July 1, @ 5*s*. and 3*s*. .	2,899	2	3			
5,689	Thursday, July 2, @ 3*s*.	2,814	8	3			
2,387	Friday, July 3, @ 2*s*. 6*d*.	2,052	14	6			
2,178	Saturday, July 4, @ 1*s*.	780	3	8			
357	Season Tickets	186	1	3			
710	Day and other Tickets	804	5	10			
17,354					10,525	12	3
£42,263	Carried forward .				£35,258	4	6

TURE OF THE SHOW AT BRISTOL,

JULY 4, 1936.

Figures for 1935 Show £	Expenditure	£	s.	d.	£	s.	d.
	COST OF ERECTION AND MAINTENANCE OF SHOWYARD :—						
3,051	Transferring Society's permanent buildings from Newcastle-upon-Tyne and re-erecting at Bristol . . .	3,483	7	10			
720	Fencing round Showyard . . .	311	13	8			
1,860	Implement Shedding	1,752	18	9			
5,063	Stock Shedding	5,436	9	1			
2,492	Grand Stand, Offices, Rings, Signs, etc.	2,837	15	0			
863	General Labour and Horse Hire . .	1,222	6	0			
112	Hire of Sleepers	111	17	6			
2,077	Hire of Canvas	2,177	6	5			
—	Excavating Post Holes . . .	620	17	5			
					17,954	11	8
16,238							
	SURVEYOR :—						
667	Salary, Travelling and Sundry Expenses	740	4	6			
287	Clerk of Works : Salary and Travelling	252	1	3			
					992	5	9
954							
	PRINTING :—						
604	General Printing, Prize Sheet, Tickets, etc.	592	9	7			
1,187	Catalogue, Award Lists and Jumping Programmes	1,079	3	8			
					1,671	13	3
1,791							
	ADVERTISING :—						
849	Newspaper Advertising	790	6	1			
379	Billposting and Window Cards, etc. .	674	8	1			
94	Advertisement Boards	183	12	10			
					1,648	7	0
1,322							
208	POSTAGE, CARRIAGE, ETC.				221	5	4
12,410	AMOUNT OF PRIZES AWARDED (including £2,077 17*s.* 4*d.* given by various Societies and others—per contra). .				12,335	2	4
716	FORAGE FOR LIVE STOCK				921	12	1
640	JUDGES OF STOCK : FEES AND EXPENSES				529	14	11
£34,279	Carried forward . . .				£36,274	12	4

STATEMENT OF RECEIPTS AND EXPENDITURE

Figures for 1935 Show £	Receipts (contd.).	£	s.	d.	£	s.	d.
42,263	Brought forward . .				35,258	4	6
	ADMISSIONS TO GRAND STAND :—						
1,124	Reserved Seats	785	8	6			
1,290	Unreserved Seats	1,101	7	6			
2,414					1,886	16	0
	MISCELLANEOUS RECEIPTS :—						
1,362	Admissions to Flower Show . .	1,439	14	5			
1,302	Motor Parks	2,199	10	0			
92	Rent for Railway Offices . . .	111	0	0			
400	Premium for Catering . . .	400	0	0			
50	Premium for Cloak Rooms . . .	50	0	0			
170	Rent of space for Ministry of Agriculture	50	0	0			
150	Advertisements in Stock Prize Sheet .	143	13	10			
141	Sales of Produce at Dairy . .	127	3	11			
14	Newcastle-upon-Tyne Show :— outstanding items	25	11	9			
6	Sundry Receipts	3	9	8			
3,687					4,550	3	7
					41,695	4	1
	Debit Balance				1,667	9	5
£48,364					£43,362	13	6

Examined, audited, and found correct this 30th day of November, 1936.

T. B. TURNER, *Secretary.*

PRICE, WATERHOUSE & CO., *Chartered Accountants.*

OF THE SHOW AT BRISTOL (*continued.*)

Figures for 1935 Show £	**Expenditure** (*contd.*).	£ s. d.	£ s. d.
34,279	Brought forward . .		36,274 12 4
	GENERAL ADMINISTRATION :—		
263	*Honorary Director* :—Travelling, Entertaining, etc.	222 17 5	
301	*Stewards and Assistants* :—*Stock, Hospitality and Implements* :—Personal and Railway Expenses	293 0 3	
669	*Secretary and Staff* :—Travelling, Maintenance, etc.	554 14 9	
709	*General Management* :—Finance Stewards, Grand Stand Men, Turnstile Men, Bank Staff, £253 7*s.* 8*d.*; Catalogue Sellers, £80 5*s.* 4*d.*; Foremen and Yardmen, £203 0*s.* 4*d.*; Gatekeepers, £126 15*s.* 4*d.*; Commissionaires, £16 10*s.* 0*d.*	679 18 8	
128	*Veterinary Department* :—Inspectors .	123 15 3	
192	*Engineering Department* :—Consulting Engineer	159 4 11	
477	Police	342 4 3	
2,739			2,375 15 6
	GENERAL SHOWYARD AND MISCELLANEOUS EXPENSES :—		
1,224	*Dairy* :—Building, £442 11*s.* 11*d.*; Steward, Assistants and Staff, £285 14*s.* 5*d.*; Milk, £240 17*s.* 6*d.*; Utensils, £90 10*s.* 0*d.*; Engineers, £95 2*s.* 3*d.*; Miscellaneous, £84 6*s.* 10*d.*	1,239 2 11	
539	*Poultry and Produce* :—Buildings, £376 12*s.* 7*d.*; Miscellaneous, £175 0*s.* 6*d.*	551 13 1	
688	*Flower Show* :—Hire of Tents, etc., £414 9*s.* 5*d.*; Miscellaneous, £254 14*s.* 9*d.*	669 4 2	
38	*Motor Parks* :—Tents, Offices, etc. .	21 11 6	
85	Plantations Competition . . .	85 13 9	
196	Forestry :—Tent and Miscellaneous .	255 9 4	
706	Military Display	364 14 0	
274	Band	216 0 0	
246	Hire of Furniture	321 17 6	
116	Royal and Official Luncheons . .	276 10 2	
50	St. John Ambulance	53 10 0	
96	Insurance	93 12 6	
68	Medals and Expenses *re* Cups . .	73 11 6	
98	Badges and Rosettes	110 9 6	
40	New Implements :—Testing and Medals	64 18 3	
6	Newcastle-Upon-Tyne Show : — outstanding items	12 5 4	
370	Sundry expenses	302 2 2	
4,840			4,712 5 8
41,858			
6,506	Credit Balance		—
£48,364			£43,362 13 6

Proceedings at General Meeting of Governors and Members

HELD IN THE CONFERENCE TENT IN THE BRISTOL SHOWYARD,

THURSDAY, JULY 2nd, 1936,

SIR MERRIK R. BURRELL, Bt., C.B.E. (President), IN THE CHAIR.

The PRESIDENT said it was indeed a great pleasure to preside at that meeting of the Governors and Members in such a well-arranged Showground and during a period of what, there was not the slightest doubt, would have been one of the most successful Shows if the weather had been kind.

He felt that those present would wish him to express their gratification that His Majesty the King had been graciously pleased to become Patron of the Society, thus continuing the close association of the Royal Family with the Society ever since its foundation; for Queen Victoria, King Edward the Seventh, and His late Majesty King George the Fifth were successively Patron to the Society.

It was, too, a great honour to the Society to receive a visit on the previous day from their Royal Highnesses the Duke and Duchess of York. They had asked him to tell Governors and Members that they had enjoyed their visit extremely. They were most interested in the Show and wished to thank everyone concerned.

Continuing, the President said his first real duty that morning was to express the Society's most sincere thanks to Mrs. Smyth for having put that fine ground at their disposal. It was a most generous action, for, without it, it was doubtful whether they could have held a Show at Bristol at all. Finding suitable sites was extremely difficult and was getting more so year by year.

Before proceeding further, he wanted to say this. Amongst all the pleasures of being President this year he had one regret—that they had not had with them at the Show Lord Daresbury. He did not know when his Lordship first became connected with the Show—it was before his time—but it was a great number of years ago. The Society had never had a better friend and probably it never would. He (the President) was sorry that in his year they did not see Lord Daresbury's familiar figure about the Showground. With their approval, he wanted to send to his Lordship a telegram saying that he was in their thoughts, that they were missing him, and that they wished him well (applause).

It would be seen how well the site had been adapted for the purposes of the Show and what a wonderful display of implements and stock they had on the ground. They had, of course, all read in the Press that the total number of entries in all sections was well above the average and he was not going to bore the meeting with comparative figures of this with other Shows. They were extremely good, and that was enough to say.

Apart from the exhibition of implements and live stock in the competitive sections, he would like to call the attention of those who had not already visited it to the special Agricultural Education and Research department in the Show, which had been arranged for the express purpose of conveying to the practical farmer, in an easy and understandable manner, the latest scientific knowledge gained by Research workers, sometimes after years of experimentation. There was the fine exhibit put up by the Bristol University in conjunction with the Ministry of Agriculture and the Agricultural Organisers of that district.

The Ministry's own exhibit explained the work it was doing to improve marketing methods, and the comprehensive show made by the British Electrical Development Association and the North Somerset Electric Power Co., demonstrated the harnessing of electric power to all agricultural operations.

The Society's own Forestry Exhibition and Working Dairy were extremely interesting, and the Flower Show was well up to standard. There had been few better.

They were receiving at that Show many hundreds of visitors from the Dominions and Oversea, all of whom had expressed their admiration of the general lay-out of the Show and its organisation.

He hoped that those present at the meeting would not think that he had dwelt upon the Show too much. After all, it must be remembered that it was not only the Society's great Shop Window, but that of Agriculture and all the many industries which supplied the agriculturist with what he required.

The Show was not, however, the sole reason for the Society's existence; it had also its advisory and consultative departments, and he would ask Governors and Members to make this side of the Society's work better known and to make more use of it themselves, for the advice and help the Society offered was from the leading experts in their particular lines in this country.

For instance, where could they obtain better advice on veterinary problems than from the Royal Veterinary College in London. The Society placed at their disposal, at very much reduced fees, the knowledge and experience of the highly trained staff of the College who were in daily touch with research work and the treatment of animal diseases of all kinds.

The Professors of the School of Agriculture, at Cambridge, were only too glad to help Members in any difficulties they might have in connection with plant diseases, with failure of crops and with insect pests, while the Consulting Chemist, Dr. Voelcker, would analyse and report on soils, fertilisers and feeding stuffs, and those kinds of things. Those privileges were offered to Members in return for not a large subscription, and he hoped they would make all possible use of them.

In a few moments resolutions would be proposed to thank various people for what they had done, and doubtless these would be received with acclamation.

It was impossible adequately to thank everyone for all the hard work they had put in. There might be individuals who had done real good service in an inconspicuous fashion, and who, perhaps, might feel that unless specifically mentioned in any formal resolution their services had not been recognised. He did try to reach some of these with his thanks while Broadcasting on the previous Thursday, and he hoped he had succeeded.

He trusted, therefore, that none of those who had really helped and did not happen to be specially mentioned would feel aggrieved, as he did want everyone to realise that the Society acknowledged with gratitude and sincerity the thanks they owed to them for their help.

The Lord Mayors for the past two or three years, the present Lord Mayor, who had been kindness itself, the Town Clerk, the Municipal Officers, the Bristol Development Board Officials, and the Press, not only in Bristol, but throughout the country, had been extremely kind, and on behalf of the Society he wanted to assure them of their gratitude (applause).

Thanks to Lord Mayor and Corporation and Local Committee.

Mr. U. Roland Burke said the resolution he had been asked to move was "That the best thanks of the Society are due and are hereby tendered to the Lord Mayor and Corporation of Bristol, and the Local Committee, for their cordial reception of the Society and their efforts to promote the success of the Show."

He would like to say how gratified he was at being asked to move that resolution, in view of the fact that he had been so closely associated with the Lord Mayor and his Committee and everyone locally who had done so much towards the success of the Show for a long time. It had been his pleasure to come very often to Bristol to meet the Lord Mayor and those connected with him, and he could tell that meeting that no one had done more to promote the success of the Show than the Lord Mayor of Bristol, the Town Clerk, Mr. Green, and his very able assistant, Mr. Young (applause). As the President had said, it was not possible to mention everyone. He felt that he would like to reel off a long list of names of those to whom they were indebted.

From the very first the Local Committee had gone all out to take efficient steps to make the Show a success. Good work had been done by the Publicity Committee, under the Chairmanship of Major Hansford, aided by the Press of Bristol and the locality. He would like to express cordial thanks for all that had been done in the publicity arrangements. Sir Merrik had mentioned the ground, but he, too, would like to express their thanks to Mrs. Smyth. All would agree that it was a very nice showyard, but they had had a great deal of difficulty. It had been said that the wise man built his home upon a rock, but he did not think they wanted the Royal Show on a rock again. He thought they would have got over all their difficulties if only the weather had been kinder. He would like particularly to thank the Bristol Waterworks Company for what they had done. They had had a very difficult job and their service had been admirably carried out. Thanks were also due to the Electricity Authorities. For the first time all the cooking on the showground had been done by electricity, and with great success.

In conclusion, he would like to say that whatever the success of that Show was going to be, the Lord Mayor and Corporation and all concerned in Bristol had done everything possible to bring it about (applause).

The **Earl of Radnor**, in seconding the motion, said that in connection with another Society he had had experience in Bristol, and on this occasion, as on the previous one, the Show had met with the same spirit of welcome and cordial co-operation as one expected from the ancient City and Port of Bristol.

The resolution was carried by acclamation.

The **Lord Mayor of Bristol** (Alderman C. T. Budgett), in reply, could not say how much he appreciated the kind expressions which Mr. Burke had used with regard to the part Bristol had to play in connection with that grand Show. It was a minor one, of course, but nevertheless they had done their best and had received the Show with enthusiasm, which perhaps had been a little damped by the conditions in which it had been held.

The Show was such an excellent medium for the spreading and cultivation of knowledge that one could scarcely realise what a factor it was in the agricultural life of the nation. The marvellous work the Society was doing could only be realised when one walked round in the mud and saw the multiplicity of exhibits of every description. The teaching which it gave was most valuable.

First of all, one could not but realise that the health and strength of the nation depended on Agriculture. It was all very well to help these various things, but it was necessary to apply these principles to practice; and that was one way in which that Show helped very materially. The health of the nation, whether in peace or war, was dependent on its power to produce, distribute and consume food, and its population could not be maintained in health and vigour unless these were effective and able to meet any contingency we might be up against.

He would like to refer to the Official Guide produced in Bristol. It was a wonderful piece of work and he hoped it would get into the hands of many visitors to the Show. They might be induced by some of the things it described not only to see the Show, but to go round the city and discover some of the delightful things it had to show them.

If Ashton Court Park, where they were holding the Show, was ever covered with houses and a new suburb grew up, he hoped it would be known by some name like " Show Regis " to commemorate the Show, but, in view of what has happened, it might more appropriately be named " Shower Regis " (laughter).

He wanted to thank Mr. Burke and the Council for all they had done for the pleasure of Bristolians. He greatly appreciated the site allotted in the showyard for his pavilion.

Referring to the Stewards, Judges and Staff under the direction of Mr. Burke, he felt that they were deeply indebted to them for their good humour in spite of difficulties and for their way of meeting the requirements forced on them through the difficult position. He could only hope that everyone was enjoying their time at the Show as much as he, the Lady Mayoress, the Sheriff and other Members of the Corporation. He sincerely hoped that the next two days would make up for the earlier part of the week.

Railwaymen Thanked.

Lt.-Col. E. W. STANYFORTH then moved : " That the best thanks of the Society are due and are hereby tendered to the Staff of the Great Western and the London Midland and Scottish Railway Companies for all the work they have done in handling so expeditiously the traffic to the Show."

This was not the first time he had been asked to propose a resolution of this kind and he had again ventured to point out that he was the last person to do it, because as he had been connected with a railway company for so many years he was not the one to be put up to sing the praises of the efficiency of the railways. Still, as he was no longer a director and had become one of the ordinary public, it was thought that he might be allowed to propose the resolution.

In these days the Railways did not have to handle the same amount of the Show traffic as they used to. In the matter of traffic they had now a comparatively easy time, but there was still a considerable amount of work in this particular case. He was one of those who never believed in the amalgamation, but it did mean that traffic from one end of the country to the other took a shorter time than it used to. He thought the general public benefited from the old rivalry between the companies. However, he must not make them think that he was antagonistic to the railways. The Great Western, being so large and influential, remained in *statu quo*, and had not had the difficulties other railways had had in amalgamating. Nowadays there were much better engines and carriages, as well as better trucks for merchandise. The Companies were spending a great deal of money and much more wisely. So that on the whole they had a good deal to thank the Railway Companies for.

SIR ARCHIBALD WEIGALL said that Col. Stanyforth had expressed surprise that for several years he had been asked to move this resolution. He could only say that there was a very good reason for asking him, on the principle that by far the best gamekeeper was drawn from the poacher class. All he could say was that railway directors were absolutely essential. They were always there to be cursed : it was the national sport. As an exhibitor he had cursed them, for he had gone with deputations to the Clearing House on every sort of detail. He did remember always that he was a small shareholder in Railway Companies, and in all discussions the poor shareholder saw the relationship between directors and shareholders. One was completely ignored, particularly as a shareholder.

It was with the greatest pleasure that he seconded this resolution of thanks to the staffs of the railways for their services in connection with the Show.

The motion was adopted.

Member's Remarks.

In response to an enquiry from the Chair as to whether any Governor or Member had any remarks to make or suggestions to offer for the consideration of the Council,

Capt. BERTRAM ROLFE asked if anything could be done to curb the exuberance of a section of the Press in their reports on the condition of the Showground. From them, readers got the idea that it was a hundred acres of bog.

The PRESIDENT said that this had not, of course, escaped their attention. Statements which had appeared on the previous day were without any foundation and must have caused loss to the Society. He was afraid, however, it was not a particularly easy matter to deal with.

Thanks to President.

Mr. JAMES WATT (Carlisle) moved a hearty vote of thanks to the President for his services in the Chair. Coming from Cumberland, he took it as a great honour to be allowed to propose this resolution. Sir Merrik Burrell, he said, was as well known in the north as in the south. Not only was his practical knowledge appreciated, but they all knew the great services he had rendered in the cause of research, the results of which must have saved farmers many thousands of pounds. He congratulated the President on the visit of their Royal Highnesses the Duke and Duchess of York. The charming Duchess delighted everyone with her beautiful smile. On the previous day she purchased and wore in the Showground a pair of clogs made of home-grown sycamore, which, he said, would do more than anything else to help the home-grown timber trade and British forestry.

Mr. GREVILLE-HEYGATE (Market Harborough) seconded the motion. While Sir Merrik had told them that he regarded his election as President as an honour and a privilege, the duties of the office must have involved a great deal of work, and Governors and Members did wish sincerely to thank him.

The motion having been put to the meeting and enthusiastically carried,

Sir MERRIK BURRELL, in acknowledging the vote of thanks, said it gave him added pleasure that it had been proposed by Mr. Watt, whose father (Sir James Watt) had been connected with the Royal Agricultural Society for so many years. He had many times had the pleasure of hearing him speak at their meetings.

He could only say that any duty that came along he was only too glad to do, because that was the only way in which he could repay them in some small measure for the great honour they had conferred on him by electing him President. He did not want to keep them there, but he did want to echo the words of the Lord Mayor in thanking the Honorary Director, the Stewards, Mr. Turner and every one of his staff, their Surveyor and his helpers and their Veterinary Officers for their wonderful team work and the individual effort they had made to organise and run that great Show. Few people realised the enormous mass of detail that had to be dealt with months before the Show, and the ceaseless energy, watchfulness, patience, tact and courtesy required every hour of the Show to deal wisely with the difficult problems that arose.

Proceedings at the Annual General Meeting of Governors and Members

HELD AT THE SOCIETY'S HOUSE, 16, BEDFORD SQUARE, LONDON, W.C.1,

On WEDNESDAY, DECEMBER 9th, 1936, at 3 p.m.,

SIR MERRIK R. BURRELL, Bt., C.B.E. (President), IN THE CHAIR.

The PRESIDENT : My Lords, Ladies and Gentlemen, I feel that the Society would wish me to express the heartfelt sympathy which every one of us feels with our Patron. The decision he has to make is a terrible one. Every king, with all that that position entails, is first of all a man. To be a great king and the head of the British Empire he must be a superman, with all that that entails. Therefore I am quite sure that I am right in saying that to-day the King has our heartfelt sympathy. ("Hear, hear.") May I say also to the two Ministers present here this afternoon how much we sympathize with the Prime Minister and his colleagues in this very troublous time? ("Hear, hear.")

My Lords, Ladies and Gentlemen, my first duty to-day in welcoming you to this meeting is to explain that, owing to an altered arrangement in connection with the organization of the Smithfield Show, we are unable to have the Annual General Meeting at the Royal Agricultural Hall, where it has been held for so many years. I do not know how this affects your convenience, but consideration will be given by the Council to any views that you may express as to the place of our meeting in the future, which the Charter states must be held in Smithfield Week and in London.

My next very pleasant duty is to welcome most warmly here to-day our new Minister of Agriculture, Mr. Morrison. (Applause.) His desire to meet the Royal Agricultural Society and his willingness to give up his time to do so is a sure sign of his determination to know personally all those who represent what is best in the industry of which he is now in charge, in order that he may learn at first hand our difficulties and our problems, and so put himself in a better position to solve them. In return, I assure him that every member of this Society and the Council, individually and collectively, will be always ready to assist him in his difficult and his all-important task. In Mr. Walter Elliot he has a great example, but a very difficult predecessor to equal, let alone surpass. But the agricultural industry should be glad to think that our new Minister will have to assist him in the Cabinet such an understanding and sympathetic colleague as he is sure to find in the new Secretary of State for Scotland. ("Hear, hear.") Somebody said to me the other day, "Who is Mr. Morrison ? " I said, " I understand that he is one of the most promising of our young statesmen," and my friend said, " I only hope he will do a great deal more than promise." ("Hear, hear," and laughter.)

In anything that I may say this afternoon, I hope that neither of the Ministers, if they should be here when I say it, will think that I am talking at them. I shall not be doing so at all. I shall be simply saying what I feel I perhaps ought to say in the position that I shall occupy for a few moments longer, and the last thing I should do would be to entice them here, on whatever motive, in order to talk at them.

If you will allow me to do so, I am going to alter the order of our proceedings slightly. We all know under what stress the Ministers are working to-day, and I will, with your leave, ask Mr. Morrison if he will say just a few words to you, in order that he may make your acquaintance. I will then carry out the very pleasant duty that I have to perform in connection with Mr. Walter Elliot, and the Ministers will then be free to leave us if their work necessitates it.

Minister of Agriculture.

The Rt. Hon. W. S. MORRISON (Minister of Agriculture), who was received with applause on rising to speak, said: Mr. President, My Lords, Ladies and Gentlemen, I thank you, Sir, for your very kind words, and I thank the Society for this opportunity which it has given me of making the acquaintance of its members. It is an opportunity which I welcome with great joy, because I am well aware, as a new Minister of Agriculture, of the disparity which exists between the scope of the problems which I have to tackle and my own abilities and knowledge.

The only cheering factors which I can hold out for your comfort, in this surprising selection of myself to be Minister of Agriculture, are these. In the first place, I have an accurate knowledge of what I do not know—(laughter)—and I often find that that is a very useful guide in the conduct of affairs of such importance as agricultural affairs. In the second place, I am glad to say that I have had the honour of representing in Parliament a Division which is purely agricultural. ("Hear, hear," and applause.) Consequently I have had to try to follow—sometimes, it is true, somewhat breathlessly—the amazing performances of my predecessor, Mr. Walter Elliot. Thirdly, the greatest comfort that I have in tackling the tasks which lie in front of me is that I have had the good fortune to possess for many years the friendship and collaboration of my predecessor, Mr. Walter Elliot, and it is to me a great comfort to know that, as Minister of Agriculture for Scotland, I shall have his counsel still to rely upon and his record to inspire me.

Mr. Elliot is present now, so I cannot say all the things which I should like to say about him. Remember, I have to live with the fellow afterwards! (Laughter.) But I think that no one who has watched the history of agriculture since 1932 up to the present time will underestimate the work which Mr. Elliot has done for the industry. (Applause.) There is no doubt at all that when he took office the industry was at the bottom of the trough of depression, and, although world conditions have remained since almost consistently unfavourable to agriculture, the schemes which Mr. Elliot introduced bear witness to his own great fertility of mind and courage, and they have undoubtedly sheltered the agriculture of this country from the full blast of the depression which has raged in every agricultural country in the world. (Applause.) I remember that Mr. Lloyd George, that master of words (especially if they are of a slightly opprobrious character), described Mr. Elliot's performances at the Ministry as a policy of shreds and patches. He said they were like a tramp's trousers—all shreds and patches. It is true that there is a great diversity in His Majesty's Government's policies for agriculture, because agriculture is not, as some people seem to imagine, one industry; it is a bundle of quite different industries, all connected together only in so far as their common end is to supply food. The real answer to the criticism of the diversity of the policies, quotas, tariffs, and so forth, is that in very cold economic weather such as we have suffered it is better to have a tramp's trousers than no trousers at all. I can well imagine that some of the critics would have preferred a long range measuring of this shivering subject with a theodolite from a safe distance, then a tremendously long period of incubation, and then a remarkably symmetrical theoretical policy for agriculture. The trouble about proceeding with the task in that way would have been simply this, that by the time such a policy had been devised there would probably have been very little agriculture to which to apply it in this country, and I think that, when the whole history of these years comes to be reckoned up, the record of my right honourable friend and predecessor in dealing with these matters will be more than justified. ("Hear, hear.")

Having said that, I do not propose to address a body which knows so much more than I do. On many of the subjects connected with agriculture I think that the meeting is far better able to address me than I am to address it, and, rather than court such a fate, which is one not uncommon to politicians in these days, I would only say, in concluding, that one great principle to bear in mind—not only for the agricultural community to bear in mind but for the whole of our people to bear in mind—is what the land is in relation to the life of the people. ("Hear, hear.") There was a time when I was slightly acquainted with the common law of England, which enshrines a great deal of practical wisdom gathered through ages of experiment, and the law of the parish church is, as you are all aware, that no one can alter its fabric, even to the extent of putting up a memorial tablet, without a cumbersome legal procedure. The theory which underlies that law is this, that the parish church, so the lawyers say, is not the possession of the incumbent for the time being or even—and this is the important point—of the generation which is worshipping in it at that time. It is the possession of the people in the widest and truest sense. It is the creation of the generations which have preceded us, and it must be the heritage of the generations which are to succeed us. We can say the same about the land. We can say that we should not suffer any sudden whim of policy to let us damage the land. The land is not ours to ravage. It does not belong to this generation, but to the generations which went before us, whose industry cleared it and tilled it and who toiled upon it. I hope that anything I can do will be directed to seeing that the land is handed down to those who will succeed us as a possession which can still lie safely at the foundation of the national life. (Applause.)

I thank you very much, Sir, for this opportunity of meeting the members of this Society. (Applause.)

Honorary Life Governors.

The PRESIDENT: I very much regret to say that Sir Percy Vincent, the late Lord Mayor of London, has telephoned to say that he is held up by fog in the south of London and cannot be with us this afternoon, as he had so much wished to do, to receive an Honorary Life Governorship of this Society.

I now have to perform, on your behalf, the extraordinarily pleasant duty of asking Mr. Walter Elliot, the Secretary of State for Scotland, to accept a certificate making him an Honorary Life Governor of this Society. (Applause.) I do not know that there has ever been a previous occasion on which any man has been made an Honorary Life Governor of the Society. People have been made Honorary Life Members, but I do not remember anybody being made an Honorary Life Governor.

If any man can weary of having his praises sung it must be the Secretary of State for Scotland. Fortunately for him and for me, there cannot possibly be any body of people who need to be told anything about Mr. Walter Elliot. You all know what he has done, and there is no need for me to tell you. That the successes he has achieved have fulfilled all he hoped to do I do not believe, nor do I believe that he wished to lay down his heavy burden until he had achieved full success. As Secretary of State for Scotland, he will have ample opportunity to collaborate with Mr. Morrison on many of his old problems and in that way to go on with the good work, and to minimize our loss he is going back again over the border to Scotland.

The Royal Agricultural Society of England, Mr. Elliot, wish to show you in some small and, I own, quite inadequate way how really grateful we are to you, and therefore, on the Society's behalf, I have the very greatest pleasure in the world in handing to you your certificate as a Life Governor, a badge to be worn by yourself, and a badge to be worn by any lady that you wish to bring to our Show—preferably Mrs. Elliot. (Laughter.) I also wish to impress on you this fact, that, by becoming a Governor of this Society, you have the privilege of attending any of our Council meetings and speaking at them, and I know that nothing would give this Society such pleasure as to see you here at their ordinary Council meetings.

I will conclude by wishing you the greatest success in your new office. May the burdens of office in the future rest rather more lightly upon you that I am afraid they have in the past. (Applause.)

The Rt. Hon. WALTER ELLIOT, M.P. (Secretary of State for Scotland): Mr. President, My Lords, Ladies and Gentlemen, it is the proudest moment in anyone's life when his work is recognised by his peers. Ignorant applause sometimes is not difficult to come by, and it is shortly afterwards followed by equally ignorant abuse. The approval of those who work in the same craft as oneself is slow to come by, but it is slow to go, and I hope that I shall never do anything to dissipate the trust and the confidence which you have placed in me by conferring upon me a Life Governorship of the Royal Agricultural Society.

I have a long acquaintance with the agricultural and learned societies of Great Britain. I happen to have had extended to me an Honorary Life Membership of the great sister Society to this Society, the Highland and Agricultural Society of Scotland, which runs the Scottish Show, the counterpart of the Royal Show. I am not the first of my family to have that close connection with the societies of the land, for my father before me was a Director of the Highland and his father before him was a Director of the Highland, so that for nearly three-quarters of a century members of my family have been Directors or Members of the Highland Society of Scotland. ("Hear, hear.") That I should now have the privilege of Life Governorship of the sister Society, the great Royal Agricultural Society of England, is indeed a very proud privilege to me. I may say it is the more welcome to me for this reason. Before I became an Honorary Life Member of the Highland Society of Scotland, I had become a Life Member by paying, and when the invitation to become an Honorary Life Member was extended to me it was explained that there was no intention of refunding any portion of my subscription. (Laughter.) Whether through parsimony or through foresight, I took the precaution of not becoming a Life Member of the Royal Agricultural Society of England, and therefore, in view of the certificate, the badge for myself and the badge for Mrs. Elliot, I shall be somewhat in pocket in the years to come. (Laughter.)

The Royal Agricultural Society has done great things for agriculture in the past. Only last night, speaking at the Farmers' Club, I had occasion to recall the pioneer work of the great farmers and adventurers in our craft of agriculture even in the last hundred years. The span which that covers is a short span as years go, yet it covers an agricultural revolution scarcely less important and scarcely less extensive than the industrial revolution of which we see the signs so far and wide in the smoking chimneys and the roaring streets of our great cities. Until the day before yesterday, as one might say, in the history of the race, the task of food production was very nearly its wholetime occupation, and famine pressed upon the hearts and homes of the people, only removed by a very few weeks or months and often actually invading the very citadel of the hearth. In my country, Scotland, famine every seven years was a regular occurrence, and men and women and children died of hunger as recently as the century before either your Society or my Society in Scotland was founded, or I may say now, since you have made me a Life Governor, before either of the agricultural societies to which I belong was founded. The old song "Potatoes grow small here; We dig them in the fall, And we eat them coats and all, Full of fear" is a reminder of what happened even later than the century before last in our sister island. Yet what we are troubled about just now is an abundance of food, a superfluity of food, a pressure from the markets of the world upon this island which we find it difficult to absorb and deal with, and nearly all that comes from discoveries which have been made in this island of ours, many of which have been made in this city of London, and half of which, I should say, have been made within two hundred miles of the very spot where we are meeting this afterooon. Great discoveries in regard to cold storage and refrigeration, great discoveries by Lawes and Gilbert, the work at Rothamsted on fertilizers, tile draining, and many other things which have revolutionized the production of food throughout the world, were the work very largely of Englishmen. The invention of the machinery which has also revolutionized agriculture, and which in its turn may be a great danger to us in the future, was greatly fostered and helped by the two Societies, the Highland Society in Scotland and the Royal Agricultural Society here in England. It was, if I remember aright, the Highland Society which first gave a prize for the reaping machine, an invention which it was said was scarcely less important than the invention of the plough itself. It was the exhibit of these tools in the Crystal Palace as recently as the Great Exhibition of 1851 which brought about the great development of agricultural machinery which we now see, one of the great industries of the world and one of the great dangers to agriculture, as we can see in the terrible disasters which have come upon the United States of America through too great a reliance on machinery and too little a reliance on what we know to be the necessity in this country—the keeping of the land in heart, without which nothing will be of any use. (Applause.)

I will not detain the meeting by dilating upon the work of the past hundred years or of the last four years at the Ministry of Agriculture, which, breathless though it has been, has also been very enjoyable to me personally. I will say only this, that any Minister of Agriculture can achieve, I think, great success if he has the confidence, the loyalty and the affection of those masters of the craft who are represented here this afternoon by your Society, Sir. I think that those of us who sit in Whitehall owe a great debt to those whose motto is "Practice with Science," as yours is. The practice and the science alike have to be interpreted. We in Whitehall endow scientific institutions, but these speak in a tongue "not understanded by the people" and have to be interpreted by such people as the members of this Society, who often at great cost to their own pockets prove how true or how untrue are the great discoveries which scientists have made. (Laughter.) Similarly in practice we bring forward many admirable counsels, but they are counsels, and it is only when you in the fields and in the countryside have put them into practice that we know whether we have prophesied rightly or wrongly. If we have prophesied wrongly, we can make another prophecy; such is the privilege of our craft. If you have planted a wrong crop or bred wrong stock, you have to go to greater pains than we to put matters right, but, unless you are willing to test out what we put forward, neither we nor you can go forward. The combination of Whitehall and the countryside is required before any advance can be made in the days in which we now live.

I said that I would not make a speech to the Society. I am here only to enjoy its hospitality, to thank it for its courtesy and to express the hope that for many years to come I may enjoy the privilege which you have been good enough, Sir, in the name of the Society, to grant to me to-day. (Applause.)

(The Rt. Hon. Walter Elliot and the Rt. Hon. W. S. Morrison then withdrew.)

The **President**: I think that if our members had known beforehand of what they have now missed by not being present this afternoon we should not have changed our venue from the Agricultural Hall to our own offices, but we should have had to engage the Albert Hall!

I am afraid we must return now to rather dull matters compared with what we have just been listening to.

A year ago, when you elected me as your President, I referred to the decrease in the membership of this Society, and it makes me feel rather ashamed that our Report shows we are still on the down-grade, though less steeply. I can only hope that a revival in agricultural prosperity will bring about a revival in our membership. Speaking as I did last year, I felt that I ought to set an example, and so I made a special effort amongst my friends in the veterinary profession and in my own county. The result was not all I had hoped to achieve, but I am deeply grateful to those who responded. I should like to point out again to all members of the Society that it is the duty of each and every one of them to get recruits and that they should not leave it to the sporadic efforts of the President, nor should they expect the members of Council to do more than they do already so unselfishly.

With regard to the Bristol Show, I must first commiserate with all those who took part in its organization. It was dreadful to see all their efforts over many months being frustrated by abnormally bad weather. In spite of this, however, everybody kept smiling and never ceased trying, and it is a matter of congratulation to all concerned that the loss on the Show did not amount to more than £1,660. What a Show it would have been if we had only had fine weather! The Show itself was in every section a really great one. Perhaps I may be forgiven if I say that one of the most impressive features was the exhibition and parade of stock belonging to members of the Young Farmers' Clubs in the district and the international stock judging contest. I am pleased to think that this movement is now so closely linked up not only with our Annual Show but more and more with the agricultural education of the country, of which it has become an integral part in many counties.

Without suitable sites we cannot begin to hold our Shows, and to Mrs. Smyth, the owner of Ashton Park, and to her Agent, Mr. Worrall, we must repeat our hearty thanks for all that they did to provide for our requirements and to help in the success that we achieved.

To Their Royal Highnesses the Duke and Duchess of York we owe a deep debt of gratitude. Not only did they travel down from London for the purpose of visiting the Show, but they took a keen and personal interest in everything they saw; they went out of their way to see and enquire about details of exhibits, and I am afraid they were very wet and very tired by the end of the long day.

We had many distinguished visitors, both from this country and from overseas. I had meant to make a special reference to the state visit of the then Lord Mayor of London, Sir Percy Vincent, if he had been here. It was a very sad thing that that great and fine spectacle of the Lord Mayor of London coming to our Show should have been spoiled by the bad weather. It was an occasion that was historical not only to our Show but to the great sister city of London, the city of Bristol, and, although Sir Percy Vincent is not here to be thanked in person, I should like to put on record our great gratitude to him for the very great effort which he made—one of the many efforts he made throughout the year to assist agriculture. ("Hear, hear.")

To those connected with the local organization we cannot give sufficient thanks. The Lord Mayor of Bristol, the Town Clerk, the local Honorary Treasurer, Mr. Davy, Major Hansford, who I am glad to say has returned to us after another election as a member of Council, and the local Press, all did their utmost in every way to assist towards a successful conclusion of the labours which they had been carrying on for more than two years.

As to the future, the Council is concerned already in arrangements for 1937 at Wolverhampton, for 1938 at Cardiff, for the Centenary Show in 1939 at Windsor, and for 1940 at Lincoln. For the invitation to Lincoln we have to thank very much our old friend Mr. Evens. I will leave our Honorary Director, Mr. Burke, to tell you about these Shows when he addresses you in a few minutes on another matter.

So much for the Show part of the Society's work, but this is not the be-all and the end-all of the Society's existence. If you look carefully at the Annual

Report you will find that more than half of it is taken up by a brief description of some of the Society's other activities, in education, research and examination work. Time will not allow me to touch even lightly on these. In fact, I can only ask you to read more carefully and study more fully this side of our work, as distinct from the Society's work as a Show-promoting body.

I may give you a few instances of the valuable work which your Society has done in the past few years, which perhaps have not been brought sufficiently prominently before the notice of the members. In the last few years your Society has, among many other things, held extensive tractor trials, established and been responsible for the quarantine station, financed the work on inoculation of lucerne and clovers, financed all the initial work on mastitis, and initiated a campaign against sheep scab, in the face, I may say, of considerable opposition. I remember so well, in, I think, 1928 or thereabouts, going on behalf of your Society to interview the officials of the Ministry of Agriculture on the enormous increase in the incidence of sheep scab. The number of outbreaks at that time was over 740 a year, and we were determined that something should be done. I was told that it was impossible, that if the Ministry's inspectors were sent into Wales they would be met by the Welsh farmers with guns. I came back and reported to your Society, and I must say that we did not pay very much attention to that kind of obstruction. We proceeded to circularize all the county councils of England. That action did not meet with great favour from the Ministry, but we persevered, and to-day I am glad to tell you that, as a result of the efforts of your Society, sheep scab is within a short distance of being entirely eliminated from these islands. I think it is well that the members of this Society should sometimes know the result of the efforts of its Council.

It is a mistake to think that, because your Council steers the Society carefully clear of politics as such, it never makes its influence felt on questions of administration and agricultural policy. For example, as far back as May 1st of last year we passed the following resolution and sent it to the Minister: "That the Council of the Royal Agricultural Society of England views with great anxiety the existing method of election of Agricultural Marketing Boards, and urges the Minister of Agriculture to reconsider this matter with a view to some drastic alteration being made in such method." This applied to all Marketing Boards, not to the Milk Marketing Board only. We followed that up with a memorandum of evidence to the Milk Marketing Reorganization Commission. You have recently had in your hands, perhaps, the Report of that Commission, and I can only say that, after reading as much of that Report as I have had time to read, I am convinced that the line that your Council took nearly two years ago has been fully supported by many of the recommendations of the Commission. I do not want to occupy your time now by dealing with that Report, but I should like to say this, that of the five existing schemes the one which appeals to me far and away the most is that of Northern Ireland, and I firmly believe that, with a little adaptation, a somewhat similar scheme could well be made to fit both England and Scotland.

If you look at page 17 of the Report of the Council you will see a letter addressed to the Minister of Agriculture last July on the subject of beef production. The members of the Council hold, as do many other people, that the question of beef production and the production of stores of the quality necessary for high class beef production is the key to the whole agricultural problem. We said so before Ottawa, we have said so ever since, and I say so again to-day. Things have gone from bad to worse since Ottawa and will take far more retrieving now than if this problem had been tackled boldly then. The prosperity of the stock-raising areas and of the corn-growing areas and the lessening of the milk surplus all turn on it, and I do implore the Government to be bold and generous in tackling it now. Before the Live Stock Bill is finally passed, Parliament must be sure that the provisions in it are really adequate not only to maintain those still remaining in beef production but also to entice men to face the expensive re-transfer from milk to beef and store cattle raising. ("Hear, hear.") It is infinitely more difficult, having put your buildings in order for the purpose of milk production, to go back from milk production to store cattle and beef production than it is to go from store cattle and beef production to milk production. Going one way you get money coming in every month; going the other way you have to face a definite lag before you get any money coming in, and farmers will need considerable inducement to face that position. The very safety of our country in the event of a war prolonged beyond a few months depends upon this. The comparative statistics of agricultural produce for 1914 and 1935 are terribly misleading and they only cause people to be dangerously complacent. The facts which really matter are these: our arable area is smaller, our agricultural labourers are fewer, most of our land has deteriorated in fertility, and the quality of store cattle is worse. Our main increases have been in pigs, poultry and market gardening, excellent in times of peace but worse than useless in war time, except to eat in the early period of the war. You must remember that pigs and poultry are rivals to the human population for cereals. That was what caught the Germans out, and we shall be fools if, after their experience, we let it catch us out. There is a very wise man sitting in this room to-day, and if I am talking nonsense I hope he will tell me so. He is smiling and shaking his head.

Mr. L. C. TIPPER: We are all in agreement, Sir.

The PRESIDENT: What we must have is an agricultural peace time policy which will produce on the day war breaks out, not two years later, the maximum quantities of wheat, beef and mutton. ("Hear, hear.")

Let me add one final word. I believe that the difficulty which Mr. Duff Cooper is finding to-day in recruiting for the Army is largely due to the fact that the finest recruiting ground in the world, the agricultural population, is far less than what it was in years gone by.

Balance Sheet.

The PRESIDENT: I now present the Balance Sheet, which you all have in your hands, and no doubt you have all studied it. I beg formally to move the adoption of the Balance Sheet for 1935, together with the Accounts of the Bristol Show.

The motion was carried.

Report of the Council.

The PRESIDENT: The Report has been printed and circulated through the post to each member of the Society. The meeting will probably be willing that it should be taken as read. (Agreed.)

Mr. R. S. WALTERS: Mr. President, My Lords, Ladies and Gentlemen, I am quite sure that the rank and file of the Society sympathize with the Council in the matter of the climatic conditions at Bristol having been so unfavourable, and I am equally confident that the Council should be congratulated on the fact that the loss on the Show, as shown on the Accounts to-day, was not, owing to the adverse weather conditions, even greater.

Mr. President, the lengthy Report of the Council needs very little comment from any of the rank and file, but I do venture to suggest to you, Sir, that those of the 9,000 members who have read the Report—and I hope the majority have done so—will have been primarily interested in the letter on page 17 to which you have referred, the letter from the Council to the Ministry of Agriculture on the beef question, which was sent last July. After the very cheering speeches to which we have listened from our politicians to-day, I should be very loth to strike a divergent note or any note which may indicate that we are not all in accord with what they suggested to us, but I do definitely state that the rank and file of the members of this Society must be in accord with the views you have expressed, Sir, and I would go further and say what you possibly thought it would not be wise to say. I should like to remind the members of this Society that the price of beef is definitely lower to-day than it was when the late Minister of Agriculture came into office five years ago. It has been sinking and it is still sinking, and I am personally confident, from my own experience as a farmer, that my sheep have always paid during the last ten years, that my pigs have never lost money, and that therefore my increasing loss on farming must be entirely due to the loss on beef. Consequently I have come to this conclusion, that if we are to produce at a minimum it must be bad for the country. I feel confident that the less I produce the smaller my loss. That being so, Sir, if it is carried through the whole country, so far as beef is concerned, it must be really bad for the individual but it must be worse for the country.

May I, Sir, express the hope that during the coming year the Council will not fail, when an opportunity arises, to continue the work which they carried out in July last in a similar direction ?

I have very much pleasure in proposing the adoption of the Report.

Mr. HENRY GRIDLEY : My Lords, Ladies and Gentlemen, it is with pleasure that I second the proposition for the adoption of the Report which has just been so ably moved by Mr. Walters. I am very proud to stand here to-day as a Norfolk man, for this reason, that Sir Percy Vincent, the late Lord Mayor of London, was a Norfolk man, and I am very sorry that I have not had the pleasure of meeting him here this afternoon.

The motion was put to the meeting by the President and was carried.

Election of President.

Lt.-Col. SIR ARCHIBALD G. WEIGALL, K.C.M.G. : Mr. President, My Lords, Ladies and Gentlemen, I have the privilege of moving the election of Mr. U. Roland Burke as our President for the coming year. (Applause.) If a friendship of over forty years gives me any claim, I feel I am not presumptuous in saying that there is hardly another man in the room who is so privileged.

When I look at the board in this room which contains the names of the former Presidents of this Society, I cannot help feeling how happy our old friend Cecil Parker would have been had he lived to see this day. Just over forty years ago there were four pupils with Cecil Parker on the Duke of Westminster's Eaton estate. Three of them have received the highest honour that the Land Agents' Society can bestow, namely, the Presidency of the Land Agents' Society, and the fourth is here to-day to receive the highest honour of the Royal Agricultural Society of England. That is a great tribute to Mr. Cecil Parker, because I am sure that Mr. Burke will agree with me that we were very ordinary people, who were much improved by the tutelage of Mr. Cecil Parker. But even in those days, in our irresponsible youthful days as land agent pupils, our friend here always had a steadying and a stabilizing influence on his more irresponsible companions. Forty years ago we were Assistant Stewards, and then, thirty-one years ago, I was privileged to be the best man at Mr. Burke's wedding, and I like to think that I had a hand in starting him on that journey in his life which has resulted in so much mutual happiness and mutual helpfulness. ("Hear, hear.") We are delighted to-day to see the other partner on that journey present with us. ("Hear, hear.") Mr. Burke then went on from triumph to triumph. He wrestled with the local authorities of a rising seaside resort, and the stress and strain of that was eased only by the simultaneous mastership of the local pack of hounds. Mr. Burke always had great powers of persuasion, as I know to my cost. It is the only incident in our long friendship that I remember with regret. He once came to stay with me for a week-end in Northamptonshire, and I put him on a horse which I was very fond of and which I thought was a very good horse. So great were Mr. Burke's powers of persuasion that before the week-end was over he had talked me into selling the horse to him at a price much below its value. (Laughter.)

I am delighted to think that a land agent in practice is going to be honoured in this way. When we look at the long list of former Presidents of this Society we see that they were all men who rendered tremendous services to the country, but they were all big territorial magnates, and Mr. Burke is the first man in practice as a resident land agent who has been asked to preside over the Royal Agricultural Society of England. (Applause.) I think that that is eminently desirable.

I sometimes wonder how much the average man in the street in this country realizes the responsibilities and the opportunities of a resident and agent on a great estate. He has a greater opportunity for making or marring the future of a large number of his fellow countrymen than any man in any other position. Just think what it means when you have a huge acreage, with all the separate parishes, all as entities, all with their internal jealousies, and yet all welded together if the man presiding over the estate office realizes his responsibilities, first to the estate, and, secondly, to every man, woman and child on it. It is a glorious opportunity for a man, and I do not know any land agent who has excelled Mr. Burke in maintaining the position which a resident land agent ought to maintain on an estate. He has a great example to set; he has tremendous opportunities and tremendous privileges. I always said when I was a land agent that I got a great deal more out of the estate than the owner did himself. (Laughter.) I do not withdraw that. It is perfectly true. I am not referring to sordid finance. I am referring to much bigger things that cannot be assessed in pounds, shillings and pence. But, if you do accept the position, with all its responsibilities, and enjoy the whole life of the community and share their joys and their sorrows, you have got to give a good deal back. You have got to set an example to the estate. It is because Mr. Burke has fulfilled these duties to the full that he has, by so doing, rendered a tremendous service, not only to agriculture in general but to every estate that he has ever had anything to do with.

I have not mentioned what Mr. Burke has done for this Society, because you know what he has done for it. I am only too delighted, as one of his oldest friends, to propose this motion, and I wish him every success in his year of office.

Mr. John Evens: Mr. President, My Lords, Ladies and Gentlemen, it is with real pleasure that I second the resolution that Mr. Burke be elected as President for the coming year. That is the greatest compliment and the greatest honour, I take it, that we agriculturists have it in our power to bestow on anyone.

Mr. Burke spent some part of his early life in Lincolnshire. We in my county are proud of that fact, because we think it was partly his early training there and partly our cold east winds and our necessarily hard living in that county that set him on the way to success in his calling. Consequently we feel to-day a little reflected honour and glory in the appointment that we are about to make.

It is thirty years since I first met Mr. Burke in connection with the work of this Society; that was when the Royal Show was held at Lincoln in 1907. Since then I have frequently, over and over again, been in touch with Mr. Burke in connection with the work of this Society. First he acted as Chairman of several different Committees, and I sat under him then. During the last few years you have been good enough to elect me as the Chairman of the Stock Prizes Committee, and by my election to that position and by Mr. Burke's forbearance and good nature, I have had the honour of presiding over him. In future, Sir, I shall deem it my duty to be very careful how I place my words!

Mr. Burke's connection with the work of this Society has extended over a number of years, and I commend him to you with confidence. Not only is he a sound and reliable man but he is also possessed of an extraordinary amount of tact and energy—two very useful qualities, I venture to think, in the work of this Society.

It has been my privilege to serve under about thirty different Presidents. Their names are writ large on the board in this room, to be handed down to posterity as leaders of agriculture. I tell you this, and I tell you it with all the sincerity at my command, that the gentleman whose name you are about to place on that honoured list to-day is fully capable of maintaining the fine traditions which those men have set up in the past. ("Hear, hear.") It is for that reason that I have the greatest possible pleasure in seconding this motion. I speak simply as a farmer of England. I believe that we farmers form a very large proportion of the members of this Society, and I say this, that I am perfectly certain that the election of Mr. Burke as President of this Society will meet with the general approval of the farmers of England.

The motion was carried with acclamation.

Mr. U. ROLAND BURKE, who was received with applause on rising to reply, said: Mr. President, My Lords, Ladies and Gentlemen, I find it very difficult to begin to express all that I should like to say in appreciation of the honour which you have conferred upon me to-day. I should like to begin by thanking two very dear old friends for the way in which they have proposed and seconded my election. I have known Sir Archibald Weigall for a great many years and he is a very good friend of mine. Mr. Evens I have also known for many years. I look back to very happy years when I lived in Lincolnshire and when I was associated with Mr. Evens there, not only on the Royal but on the Lincolnshire Agricultural Society.

I have had a long and close association with the Royal Agricultural Society. I became a member in 1892 and an Assistant Steward the following year, and ever since then I have been closely associated with the work of the Society and have loved it. When I consider the names of the distinguished men who have occupied the position of President of this Society and the eminent services that they have rendered to agriculture, I cannot help feeling considerable pride that the members have considered me at all worthy to occupy the position. I have always regarded the position of President of "the Royal" as a very great honour, and in fact I have always looked upon it as the blue ribbon of English country life. I hope I shall fulfil the duties of the position to your satisfaction.

It will be my very great privilege to be President next year, when the Show will be held at Wolverhampton. Wolverhampton is, as you know, a very large industrial centre. It borders also on very fine agricultural country, and through the very kind generosity of Lord Wrottesley we have been given a beautiful site in his park. We have the good fortune to have at Wolverhampton a gentleman who has thrown himself wholeheartedly into the arrangements for the Show, Sir Charles Mander, who is this year Mayor of Wolverhampton. He has from the beginning been Treasurer of the Local Fund and has practically by himself raised about £7,000 for the Local Fund. ("Hear, hear.") Through the efforts of Sir Charles Mander and the co-operation of the Corporation and everyone else there, I feel that, if only the clerk of the weather will be kinder to me than he was to you, Sir, at Bristol, there is every prospect that our visit to Wolverhampton will be crowned with success.

The Council has very kindly again appointed me Honorary Director of this Show, and I hope, although with some feelings of misgivings, to do my best in combining the two offices. If matters do go wrong, I shall have the perhaps unique privilege of being able, without any fear of retaliation, openly to criticise the President and to damn wholeheartedly the Honorary Director. (Laughter.)

As was the case with my predecessors, I know that I can look to the very loyal support of the Council, the Governors and my many friends amongst the members, assisted by Mr. Turner and his most able staff. ("Hear, hear.") I can assure you that it will be my endeavour to carry out my duties to your satisfaction and in a manner worthy of this Society. I thank you very much. (Applause.)

Election of Trustees.

The PRESIDENT: It is customary for the Trustees to be elected by a show of hands. The names of the present Trustees, who are, under Bye-law 141, recommended by the Council for re-election, are printed in List "A" on the agenda paper, and I will now ask you to signify in the usual manner whether it is your pleasure that these twelve noblemen and gentlemen should be elected Trustees of the Society to hold office until the next ensuing Annual General Meeting.

The names were as follows :—

H.R.H. The Duke of York, K.G., 145, Piccadilly, W.1.
H.R.H. The Duke of Gloucester, K.G., Buckingham Palace, S.W.1.
H.R.H. The Duke of Kent, K.G., 3, Belgrave Square, S.W.1.
Charles Adeane, C.B., Babraham Hall, Cambridge.
The Duke of Bedford, K.G., Woburn Abbey, Bedfordshire.
Sir Merrik R. Burrell, Bt., C.B.E., Floodgates, West Grinstead.
Percy Crutchley, Sunninghill Lodge, Ascot, Berkshire.
Lord Daresbury, C.V.O., Walton Hall, Warrington.
The Duke of Devonshire, K.G., Chatsworth, Bakewell, Derbyshire.
Lord Harlech, K.C.B., Brogyntyn, Oswestry, Shropshire.
Sir Arthur Hazlerigg, Bart., Noseley Hall, Leicestershire.
Lt.-Col. E. W. Stanyforth, C.B., Kirk Hammerton Hall, York.

A show of hands was taken, and the Trustees were re-elected.

Election of Vice-Presidents.

The PRESIDENT: I will also ask you to signify by show of hands whether it is your pleasure that the present Vice-Presidents, whose names are printed in List "B," should be re-elected to hold office until the next ensuing Annual General Meeting.

The names were as follows :—

U. Roland Burke, Edensor House, Bakewell, Derbyshire.
Sir G. L. Courthope, Bt., M.C., M.P., Whiligh, Sussex.
The Earl of Derby, K.G., Knowsley, Prescot, Lancashire.
Lord Desborough, K.G., Taplow Court, Maidenhead.
John Evens, Burton, Lincoln.
R. M. Greaves, Wern, Portmadoc, North Wales.
The Earl of Harewood, K.G., Harewood House, Leeds.
William Harrison, Albion Iron Works, Leigh, Lancashire.
Lord Mildmay of Flete, Flete, Ivybridge, Devon.
The Duke of Portland, K.G., Welbeck Abbey, Worksop, Notts.
The Earl of Powis, Powis Castle, Welshpool, Mont.
The Earl of Stradbroke, K.C.M.G., Henham Hall, Wangford, Beccles.

A show of hands was taken and the Vice-Presidents were re-elected.

Election of Professional Accountants and Auditors.

Major J. N. RITCHIE: Mr. President, My Lords, Ladies and Gentlemen, I beg to move that Messrs. Price, Waterhouse & Co. be re-elected as Professional Accountants and Auditors for the ensuing year.

Mr. ROBERT HORNSBY: Mr. President, My Lords, Ladies and Gentlemen, I have very great pleasure in seconding the resolution which has been proposed by Major Ritchie.

The motion was carried.

Election of Ordinary Members of Council.

The PRESIDENT: Under the Bye-laws, the requisite measures have been taken to fill the vacancies on the Council in the representation of the Districts in Group "C."

As Chairman, I have now formally to report to the Annual General Meeting the names and addresses of the Ordinary Members of the Council who have been elected by the several Divisions in order that the meeting may, in the words of the Bye-law, "take cognisance of their election." This duty I formally fulfil by placing before you List "C," on pages 3 and 4 of the printed agenda paper, in which the names of the new elected members are specially marked. This list is, however, now incomplete, as a vacancy has been created in Shropshire by the very lamented death of Mr. E. Craig Tanner.

The names were as follows:—

Cumberland: Joseph Harris, Brackenburgh Tower, Penrith.
Westmorland: Jacob Wakefield, Sedgwick House, Kendal.
Yorks (East Riding): T. L. Wickham-Boynton, Burton Agnes Hall, Driffield.
North Wales: Major W. Marshall Dugdale, D.S.O., Llwyn, Llanfyllin, Mont.
Lincoln: Eustace Abel Smith, Longhills, Lincoln.
Huntingdon: Lord Eltisley, K.B.E., Croxton Park, St. Neots.
Cambridge: S. Owen Webb, Streetly Hall, West Wickham.
Oxford: Robert Hobbs, Kelmscott, Lechlade.
Kent: J. Egerton Quested, The Firs, Cheriton, Folkestone.
Warwick: Col. C. J. H. Wheatley, Berkswell Hall, Coventry.
Gloucester: Major C. C. Hansford, 51, Queen Square, Bristol, and John Bourne, Snowshill Hill, Moreton-in-Marsh.
Glamorgan: Hubert D. Alexander, The Croft, Sully, Penarth.
Somerset: Robert Bruford, Fons George House, Taunton.
Berkshire: Henry A. Benyon, Ufton Court, near Reading.
Sussex: Walter R. Burrell, Knepp Castle, Horsham, and Lt.-Comdr. H. Sydney Egerton, D.S.C., R.N., Mountfield Court, Robertsbridge.
Ireland: The Rt. Hon. M. M. McCausland, Drenagh, Limavady, Co. Londonderry.

Norfolk: Capt. H. J. Cator, M.C., Ranworth Hall, Norwich.

Suggestions by Governors or Members.

The PRESIDENT: I will now ask whether any Governor or Member has any remark to make or suggestion to offer that may be referred to the Council for its consideration. I would especially like to ask whether anybody would care to make any remarks as to the alteration we have made this year in our place of meeting, owing to a change in connection with the organization of the Smithfield Show.

Mr. R. BORLASE MATTHEWS: Would it be possible to arrange with the body controlling the Smithfield Show to allow a pass-out to the members for the purpose of attending this meeting, if the meeting is not held in future at the Agricultural Hall? It is very much more comfortable to hold our meeting here.

The PRESIDENT: That suggestion shall receive the consideration of the Council, but it may be, of course, that the Smithfield Club would say that any member of the Royal might just as well be a member of the Smithfield Club.

Vote of Thanks to the Retiring President.

Lord HASTINGS: My Lords, Ladies and Gentlemen, the privilege is accorded to me of dealing with the last item on our agenda, which is to accord a vote of thanks to our retiring President, Sir Merrik Burrell.

This Society has indeed been fortunate in its Presidents. Each one in his turn has added lustre and distinction to the office which he has held. Even so, I think we would all agree—and I feel justified in claiming—that none has added a greater distinction than the President who has served us in 1936. (Applause.) Of the four fields of agricultural endeavour—practical, scientific, administrative and political—Sir Merrik Burrell has achieved eminence in three. As a practical agriculturist his name is well known to the farmers of England as that of a discriminating and successful breeder of horses and cattle. In the field of science, Sir Merrik's services to the Agricultural Research Council and his long services to the Royal Veterinary College entitle his voice to be heard in any assembly of agricultural scientists. In administration, his services in the first instance to this Society's Council, his services to the Council of Agriculture for England, to the County Councils' Association and to innumerable other bodies which he has served, either as a member or in the Chair, entitle him to claim an administrative knowledge equalled by few and excelled by none. ("Hear, hear.") And, My Lords, Ladies and Gentlemen, to this he has now added a gift for hospitality and for genial presidency over the social side of this Society's life which will be remembered for long by all those who have had the privilege of enjoying it during his year of office. I think there is no member of the Council and no member of the Society who will not carry with him a recollection of complete satisfaction and grateful recognition of what Sir Merrik Burrell has done in his year of office for the Royal Agricultural Society of England. When the Council decided to offer him this post last year, it felt that in honouring him it would also be honouring itself, and indeed that thought has proved to be the truth.

I beg to move that a very hearty vote of thanks be accorded to Sir Merrik Burrell for his services to the Society during the past year. (Applause.)

Mr. ROBERT BRUFORD: My Lords, Ladies and Gentlemen, it gives me very great pleasure to second the resolution so ably proposed by Lord Hastings. Lord Hastings has left me nothing to say; I agree with every word he has uttered, for once in my life. (Laughter.) I should like to say a little more about Sir Merrik, but I do not know whether I can. One thing I do remember at Bristol: notwithstanding the downpour of rain, Sir Merrik was like a sun gleaming through the dark clouds all the time. No matter where we met him, he was always cheery and he was always kind to us. Even when we were muddy all over, Sir Merrik always made us comfortable and happy, and he treated us like fighting cocks. I have never known a more hard-working man in any walk of life. I do not know anyone who takes more trouble to do his duty and to do good to his fellow men than Sir Merrik Burrell does.

The motion was put to the meeting by Lord Hastings and was carried with acclamation.

The PRESIDENT: My Lords, Ladies and Gentlemen, I do not know how to find words to thank Lord Hastings and Mr. Bruford for the kind things they have said about me, but anybody who has occupied the position of President of this Society knows quite well that he needs no thanks. It is for anybody who occupies this Chair to thank the Society for the privilege of so doing, and there is no action that the President can perform during his year of office which can pay the debt of gratitude that he owes the Society for the honour that has been done to him.

If during the past twelve months I have been able to give you satisfaction, then I shall retire in a few seconds with the greatest relief in my mind, for, believe me, when I started I realized only too fully the terrific task it is to follow in the footsteps of those whose names are on that board to which reference has been made so often this afternoon. If I have not let the Society down, I am content. If you are content with what I have done, I am very pleased.

I conclude by thanking you once again most cordially for the honour you conferred upon me in electing me as your President, and I thank you for the kind way in which you have received this resolution this afternoon. Believe me, as long as I live I shall never forget the year when I was President of the Royal. (Applause.)

Royal Agricultural Society of England.

AWARDS OF PRIZES

AT

BRISTOL, 1936.

ABBREVIATIONS.

I., First Prize. II., Second Prize. III., Third Prize. IV., Fourth Prize. V., Fifth Prize. VI., Sixth Prize. R.N., Reserve Number. H.C., Highly Commended. C., Commended.

The responsibility for the accuracy of the description or pedigree, and for the eligibility to compete of the animals entered in the following classes, rests solely with the Exhibitors.

Unless otherwise stated, each Prize Animal in the Classes for Horses, Cattle, Goats, Sheep, and Pigs, was " bred by Exhibitor."

HORSES.

Shires.

Class 1.—*Shire Stallions, born in* 1933.

4 I. £20.—James Forshaw & Sons, Carlton-on-Trent, Newark, for **Donation 41638**, black, bred by E. H. Mallaber, Shustoke Hall, Coleshill, Birmingham; *s.* Coleshill Dagnam 40055, *d.* 122838 Bouncer *by* Ansty Forest John Willie 33677.

5 II. £10.—R. Haigh, Peny Gardden, Ruabon, for **North Regent 42060**, grey, bred by D. Thomas, Clwyd-yr-Onen, Guilsfield, Welshpool; *s.* Ashlands Grey King 41084, *d.* 127940 North Damsel *by* Lincoln What's Wanted 2nd 35812.

8 III. £5.—F. W. Parsons & Sons, Speckington, Ilchester, for **Whittlesea Coming King 41842**, bay, bred by W. S. Smith, Thorney, Peterborough; *s.* Pendley Harvester 40368, *d.* 122755 Ashill Coma *by* Ditchingham John 38164.

Class 2.—*Shire Stallions, born in* 1934.

10 I. £20 & Champion.[1]—E. Bostock, Gibbet Hill, Coventry, for **Old House Conquering Mimic 42065**, brown, bred by W. A. Tipping, Holly Bank Farm, King's Heath, Birmingham; *s.* Kirkland Mimic 39739, *d.* 122008 Harcourt Belle *by* Seedsman 39589.

15 II. £10.—James Forshaw & Sons, Carlton-on-Trent, Newark, for **Lillingstone Winalot 42020**, bay, bred by H. Eady Robinson, Higham Ferrers; *s.* Bower Winalot 40672, *d.* 120997 Lillingstone Remembrance *by* Marden Premier 37635.

13 III. £5.—The Duke of Devonshire, K.G., Chatsworth, Bakewell, for **Thomas James**, bay, bred by J. G. McDougall, Chippinghurst Manor, Cuddesdon; *s.* Radium 5th 40376, *d.* 128077 Ruth of Chippinghurst *by* Rattle 4th 40380.

Class 3.—*Shire Stallions, born in* 1935.

20 I. £20 & R.N. for Champion.[1]—James Forshaw & Sons, Carlton-on-Trent, Newark, for **Carlton Winalot**, brown, bred by Charles Banks, Waresley, Sandy, Beds.; *s.* Bower Winalot 40672, *d.* 123521 Alnwick Buttercup *by* Hedges Champion's Surprise 39509.

17 II. £10.—William J. Cumber, Theale, Berks., for **Leckhamstead What's Wanted** black, bred by O. Lester & Sons, Leckhamstead, Bucks.; *s.* Tilton What's Wanted 40637, *d.* 125359 Haseley Mischief *by* Haseley Heirloom 40536.

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[1] Champion Gold Medal, and £5 to the Reserve, given by the Shire Horse Society for the best Stallion. A Prize of £2 is also given by the Shire Horse Society to the Breeder of the Champion Stallion, provided the Breeder is a Member of the Shire Horse Society, and the dam of the animal is registered in the Shire Horse Stud Book.

19 III. £5.—The Duke of Devonshire K.G., Chatsworth, Bakewell, for **Chatsworth Friar Secundus**, brown, bred by A. Bonsall, Hall Farm, Hartington, Buxton; *s.* Cippenham Friar 38110, *d.* 125357 Hartington Pearl *by* Sundridge Nulli Secundus 36952.

18 R.N.—William J. Cumber, for **Theale Diplomat.**

Class 4.—*Shire Mares, with their own foals at foot.*

23 I. £20.—William J. Cumber, Theale, Berks., for 124607 **Hafren Marchioness**, bay born in 1930 [foal *by* Etchingham Black Friar 41146], bred by F. B. Bower, Oxcroft, Shuttlewood, Chesterfield; *s.* Cippenham Friar 38110, *d.* 112775 Roseland Marchioness *by* March King 34955.

24 II. £10.—E. R. Morey, Woodcutts, Salisbury, for 126043 **Elworth Fashion**, bay, born in 1932 [foal *by* Theale Richard 40179], bred by Dinam Estates Co., Llandinam, Mont.; *s.* Curlieu Active Boy 39154, *d.* 116599 Hafren Queenie *by* Hafren Invincible 38260.

Class 5.—*Shire Colt or Filly Foals, the produce of Mares entered in Class* 4.[1]

27 I. £10.—E. R. Morey, Woodcutts, Salisbury, for black filly, born March 12, 1936; *s.* Theale Richard 40179, *d.* 126043 Elworth Fashion *by* Curlieu Active Boy 39154.

26 II. £5.—William J. Cumber, Theale, Berks, for bay filly, born May 26, 1936; *s.* Etchingham Black Friar 41146, *d.* 124607 Hafren Marchioness *by* Cippenham Friar 38110.

Class 6.—*Shire Mares, born in or before* 1932, *not having a foal at foot. A Mare* 6 *years old or over must have produced a live foal in* 1935 *or* 1936.[1]

30 I. £15 & Champion.[2]—James Gould, Crouchley Hall, Lymm, Cheshire, for 126214 **Lymm Lady Grey**, grey, born in 1932, bred by G. Roberts, Hazelmere, Creswell, Mansfield; *s.* Carlton Grey Kingmaker 40240, *d.* 118338 Hazelmere Frieze *by* Harboro Nulli Secundus 33231.

29 II. £10.—William J. Cumber, Theale, Berks., for 127514 **Cambrian Pearl**, black, born in 1932, bred by the late W. Prytherch, Bodfeddan, Tycroes; *s.* Theale Richard 40179, *d.* 87807 Cambrian Lilac *by* Rickford Coming King 27709.

32 III. £5.—Sir Ernest S. Wills, Bart., Littlecote, Hungerford, for 124785 **Maidencourt Gloaming**, bay, born in 1930 [filly foal born May 2, 1935, *by* Theale Josh], bred by H. T. Hincks, Keyham Hall, Leicester; *s.* Maidencourt Heirloom 40330, *d.* 114770 Maidencourt Rose *by* Field Farm Clansman 36556.

Class 7.—*Shire Fillies, born in* 1933.

35 I. £20.—James Gould, Crouchley Hall, Lymm, Cheshire, for 126610 **Batty Grace Darling**, brown, bred by Robert Jemson, Batty Hill, Cockerham, Lancaster; *s.* Edingale Blend 40272, *d.* 114876 Mill House Brock *by* Buscough Ironclad 37194.

33 II. £10.—His Majesty The King, Sandringham, Norfolk, for 126597 **Appleton Anne**, bay, bred by His Majesty King George V, Sandringham; *s.* Appleton Wyresdale 40202, *d.* 112789 Royal Lady *by* St. Leger Blue Blood 36048.

37 III. £5.—A. Thomas Loyd, Lockinge House, Wantage, for 126957 **Lockinge Harvest Moon**, bay; *s.* Ridgway Renown 41030, *d.* 114377 Hanbury Harboro Starlight *by* Harboro Nulli Secundus 33231.

36 R.N.—Sir Bernard Greenwell, Bart., Marden Park, Woldingham, Surrey, for **Marden Columbine.**

H.C.—38. C.—34.

Class 8.—*Shire Fillies, born in* 1934.

40 I. £20 & R.N. for Champion.[2]—Sir Bernard Greenwell, Bart., Marden Park, Woldingham, Surrey, for 127872 **Marden Daphne**, grey; *s.* Theale Josh 41311, *d.* 124746 Marden Wendy *by* Stretton Broadside 39985.

44 II. £10.—W. S. Smith, Singlecote, Thorney, Peterborough, for 128224 **Whittlesea Rosemary**, bay; *s.* Theale Crofter 41052, *d.* 125070 Whittlesea Rosebud *by* Brockhill Padre 39852.

41 III. £5.—A. Thomas Loyd, Lockinge House, Wantage, for 127834 **Lockinge Venus**, bay; *s.* Ridgeway Renown 41030, *d.* 114377 Hanbury Harboro Starlight *by* Harboro Nulli Secundus 33231.

45 R.N.—Sir Ernest S. Wills, Bart., Littlecote, Hungerford, for **Littlecote Joan.**

H.C.—42. C.—43.

Class 9.—*Shire Fillies, born in* 1935.

49 I. £20.—A. Thomas Loyd, Lockinge House, Wantage, **Lockinge Hester**, bay; *s.* Ridgeway Renown 41030, *d.* 114377 Hanbury Harboro Starlight *by* Harboro Nulli Secundus 33231.

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[1] Prizes given by the Shire Horse Society.

[2] Champion Gold Medal, and £5 to the Reserve, given by the Shire Horse Society for the best Mare or Filly. A Prize of £2 is also given by the Shire Horse Society to the Breeder of the Champion Mare or Filly, provided the Breeder is a Member of the Shire Horse Society, and the dam of the animal is registered in the Shire Horse Stud Book.

48 II. £10.—JAMES GOULD, Crouchley Hall, Lymm, Cheshire, for **Lymm Sunray**, bay *s.* Beacon What's Wanted 41089, *d.* 123153 Lymm Sunset *by* Herontye Buscot 37494.

51 III. £5.—SIR ERNEST S. WILLS, BART., Littlecote, Hungerford, for **Littlecote Bluebell**, grey; *s.* Theale Josh 41311, *d.* 124735 Maidencourt Gloaming *by* Maidencourt Heirloom 40330.

47 R.N.—SIR WALTER A. BLOUNT, BART., Mawley Hall, Cleobury Mortimer, for **Mawley Belle**.

Class 10.—*Shire Geldings, by registered sires, born in or before* 1933.[1]

3 I £20.—MANN, CROSSMAN & PAULIN, LTD., Albion Brewery, Whitechapel Road, London, E.1, for **Albion Grey King**, grey, born in 1930, bred by D. T. Gethin, Tynybryn, Tregynon, Mont.; *s.* Ponton Record 39574, *d.* 100886 Winsbury Grey *by* Nailstone King Regent 33403.

7 II. £15.—MANN, CROSSMAN & PAULIN, LTD., for **Majestic**, brown, born in 1931, bred by Edward Owen, Fron, Llanbrynmair, Mont.; *s.* Hafren Baronet 39501, *d. by* Hafren Invincible 38260.

9 III. £10.—YOUNG & CO.'S BREWERY, LTD., Ram Brewery, Wandsworth, London, S.W.18, for **Wandle Clansman**, dark bay, born in 1928, bred by David Mills, Pen Ddalfa, Llangedwyn; *s.* Dollas Clansman 39690.

6 IV. £5.—MANN, CROSSMAN & PAULIN, LTD., for **Bristol**, black, born in 1930, bred by Norman Kelsey, Keadby, Scunthorpe, Lincs.; *s.* Frithville Goalkeeper 38814, *d.* 70663 Elmside Eclipse *by* Nailstone Drayman 25466.

55 V. £5.—MANN, CROSSMAN & PAULIN, LTD., for **Blackthorn**, black, born in 1930, bred by H. T. Jones, Gwalchmai, Valley, Anglesey; *s.* Cowage Clansman 38767, *d.* Star *by* Sussex Goalkeeper 34365.

58 R.N.—ARTHUR WHITE, St. Swithin's Farm, Almondsbury, Glos., for **Victor**.

Class 11.—*Teams of Three or Four Shire Horses, mares, geldings or mixed, in harness with vehicle.*

61 I. £10.—MANN, CROSSMAN & PAULIN, Ltd., for Team of Four Geldings.
62 II. £5.—YOUNG & CO.'S BREWERY, LTD., for Team of Four Geldings.
63 III. £3.—P. SURRIDGE, Great Lake Farm, Horley, Surrey, for Team of Four.

Clydesdales.

Class 12.—*Clydesdale Stallions, born in* 1934.

67 I. £20 & Champion.[2]—JAMES KILPATRICK, Hawkrigg House, Wigton, for **Hawkrigg Choice 22697**, bay, bred by J. & F. Beaton, Mains of Glack, Pitcaple; *s.* Craigie Beau Ideal 21856, *d.* Glack Margaret 56402 *by* Dunure Footprint 15203.

68 II. £10.—T. & M. TEMPLETON, Sandy Knowe, Kelso, for **Battlement 22599**, bay, bred by Leslie Durno, Kitkhill, Old Meldrum; *s.* Benedictine 21836, *d.* Kirkhill Blossom 60445 *by* Golden Victor 19137.

64 III. £5.—JAMES KILPATRICK, Craigie Mains, Kilmarnock for **Cragie Bold Boy 22636**, brown, bred by Messrs. Greig, Housenrigg, Aspatria; *s.* Craigie Beau Ideal 21856, *d.* Dainty Dinah 61294 *by* Dunure Footprint 15203.

Class 13.—*Clydesdale Stallions, born in* 1935.

75 I. £20 & R.N. for Champion.[2]—T. & M. TEMPLETON, Sandy Knowe, Kelso, for **Stirling Castle**, bay, bred by J. Stirling, Parkhead, Alloa; *s.* Beneficent 21572, *d.* Abercromby Lady Louisa 54401 *by* Dunure Footprint 15203.

71 II. £10.—JAMES KILPATRICK, Craigie Mains, Kilmarnock, for **Craigie Handsome Lad**, bay, bred by James Gray, West Newhall, Kingsbarns; *s.* Craigie Beau Ideal 21856, *d.* Crawfordston Rena 61292 *by* Brunstane Again 20717.

Class 14.—*Clydesdale Mares, not having a foal at foot, or Fillies, born in or before* 1933. *A Mare* 6 *years old or over must have produced a live foal in* 1935 *or* 1936.

82 I. £20 & Champion.[3]—ROBERT TAYLOR, Milton Hall, Brampton Junction, Cumberland, for **Queen of Borgue** [Vol. 55, p. 118], dark brown, born in 1932, bred by James P. Russell, Netherton, Balfron; *s.* Benefactor 20867, *d.* Beauty Star 59567 *by* Rising Star 19836.

78 II., £10 & R.N. for Champion.[3]—ROBERT DALZIEL, Rue, Auldgirth, for **Rue Perfect Lady**, brown, born in 1933; *s.* Craigie Beau Ideal 21856, *d.* Rue May Queen 57974 *by* Balcairn Footnote 20701.

79 III. £5.—DAVID GOLDIE, Barassie, Troon, for **Barassie Winifred**, bay, born in 1932, bred by John Slater, Grange, Kirkcudbright; *s.* Craigie Winalot 21322, *d.* Grange Ada 55601 *by* Signet 16816.

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[1] Prizes given by the Shire Horse Society.

[2] Champion Silver Medal given by the Clydesdale Horse Society for the best Stallion.

[3] Champion Silver Medal given by the Clydesdale Horse Society for the best Mare or Filly

Class 15.—*Clydesdale Fillies, born in* 1934.

85 I. £20.—ROBERT TAYLOR, Milton Hall, Brampton Junction, Cumberland, for **Milton Marina** [Vol. 57, p. 80], bay; *s.* Craigwell 21739, *d.* Milton Marigold 60189 *by* Benefactor 20867.

84 II. £10.—GEORGE M. BECK, The Lane, Ravenstonedale, Westmorland, for **Gladys** [Vol. 57, p. 34], brown, bred by the Representatives of James Durno, Rothiebrisbane, Fyvie; *s* Benedictine 21836, *d.* Lady Sylvia 47612 *by* Dunure Footprint 15203.

Class 16.—*Clydesdale Geldings, by registered sires, born in or before* 1933.[1]

88 I. £20.—MESSRS. GREIG, Housenrigg, Brayton, Aspatria, for **Maxwell**, bay, born in 1933, bred by Messrs. Maxwell, Hayfield, Thornhill; *s.* Grenadier 21496.

89 II. £10.—JOHN TOWNSON & SONS, Wackerfield Hall Farm, Staindrop, Darlington, for **Jock**, black, born in 1930, bred by the late Mr. Wheatley, Croft Farm, Carlisle *s.* Downhill Blue Ribbon 21063.

90 III. £5.—WYNDHAM T. VINT, Thorn Cottage, Wroot, Doncaster, for **Hope**, bay, born in 1931, bred by Thomson Barns, Low Eskrigg, Wigton; *s.* Braidley Eminent 20514

86 R.N.—MESSRS. GREIG, for **Baird.**

Class 17.—*Clydesdale Geldings, by registered sires, shown in a single turn-out.*

89 I. £20.—JOHN TOWNSON & SONS, for **Jock.** [See Class 16.]

Class 18.—*Teams of Three or Four Clydesdale Horses, mares, geldings or mixed, in harness with vehicle.*

[No Entry.]

Suffolks.

Class 19.—*Suffolk Stallions, born in or before* 1932.[2]

100 I. £20 & Champion.[3]—DENNIS WALKER, Trowse, Norwich, for **Holkham Pioneer 6120**, born in 1928, bred by the Earl of Leicester, Holkham, Norfolk; *s.* Horstead Punchinello 5096, *d.* Holkham Primrose 12768 *by* Bawdsley Earl 4736.

97 II. £10 & R.N. for Champion.[3]—STUART PAUL, Kirton Lodge, Ipswich, for **Woolverstone Eclipse 6207**, born in 1931, bred by the late Major J. A. Berners, O.B.E., Woolverstone Park, Ipswich; *s.* Admiral of Riddlesworth 5966, *d.* Woolverstone Morn 12503 *by* Woolverstone Arthur 4949.

98 III. £5.—FRANK SAINSBURY, Blunts Hall, Little Wratting, Haverhill, for **Bawdsey Dear Sir 6228**, born in 1931, bred by Sir Cuthbert Quilter, Bart., Bawdsey, Woodbridge; *s.* Sir Harry of Morston 5676, *d.* Bawdsey Dear 11352 *by* Bawdsey Hay 4188.

96 R.N.—T. J. BAILEY, Hill Farm, Roxwell, Essex, for **Golden Grain of Morston.**
H.C.—94.

Class 20.—*Suffolk Stallions, born in* 1933.

104 I. £20.—H. ERNEST HOLMAN, The Belt, Aylsham, for **Trapeze of Cockfield 6416**, bred by J. R. Sankey, Wyverstone Park, Stowmarket; *s.* Darsham Duke 5878, *d.* 13209 Park Pride *by* Bawdsey Sir Douglas 4834.

103 II. £10.—S. A. CUFF, Westlecott, Ogbourne St. George, Marlborough, for **Holkham Earl 6414**, bred by the Earl of Leicester, Holkham, Norfolk; *s.* Holkham Pioneer 6120, *d.* Massingham Viper 14781 *by* Horstead Vanguard 4784.

106 III. £5.—DENNIS WALKER, Trowse, Norwich, for **Trowse Lord Foch 6389**; *s.* Lord Foch of Frithville 6174, *d.* Surlingham Rose 13258 *by* General John 4657.

Class 21.—*Suffolk Stallions, born in* 1934.

113 I. £20.—SIR CUTHBERT QUILTER, BART., Bawdsey, Woodbridge, for **Bawdsey Sceptre 6471**; *s.* Bawdsey Martian 6029, *d.* Bawdsey Spangle 16101 *by* Sir Harry of Morston 5676.

107 II. £10.—G. & R. BLEWITT, Boxted Hall Farms, Colchester, for **Boxted Arabi 6479**; *s.* Riddlesworth Satrap 6048, *d.* Westwood May Morn 10447 *by* Darsham Valentine 4275.

111 III. £5.—STUART PAUL, Kirton Lodge, Ipswich, for **Samford Quartermaster 6453**; *s.* Worlingworth Bonfire 6244, *d.* Samford Lark 15748 *by* Shotley Counterpart 4903.

116 IV. £4.—ERNEST BRAITHWAITE SAVORY, Warren Farm, Streatley, Berks., for **Laurel Goldfinder 6435**, bred by P. Adams & Sons, Laurel Farm, Felixstowe; *s.* Bawdsey Sir Roger 5970, *d.* Raveningham Betty 14497 *by* Raveningham Cider Cup 5326.

115 R.N.—FRANK SAINSBURY, Blunts Hall, Little Wratting, Haverhill, for **Wratting Emperor.**
H.C.—118. C.—108.

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[1] Prizes given by the Clydesdale Horse Society.

[2] Prizes given by the Suffolk Horse Society.

[3] The "Coronation" Perpetual Silver Challenge Cup given by the Suffolk Horse Society for the best Stallion.

Class 22.—*Suffolk Stallions, born in* 1935.

121 I. £20.—P. Adams & Sons, Laurel Farm, Felixstowe, for **Laurel Laddie 6547**; *s.* Bawdsey Sir Roger 5970, *d.* Laurel Keepsake 14926 *by* Shotley Counterpart 4903.

122 II. £10.—J. A. Marsden Popple, Daneshill, Stevenage, for **Daneshill Royal 6525**; *s.* Boulge Rodney 6047, *d.* Wildham Arabis 15628 *by* Bawdsey Kwang Su 5700.

124 III. £5.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Wratting Imperial 6567**; *s.* Red Gold of Wratting 5932, *d.* Wratting Empress 15236 *by* Bawdsey Emperor 5717.

Class 23.—*Suffolk Mares, with their own foals at foot.*

136 I. £20 & R.N. for Champion.[1]—Frank Warren, Godbolts, Marks Tey, Colchester, for **Godbolts Audrey 16534**, born in 1931 [foal *by* Moulton Mars 6287]; *s.* Godbolts Hero 6027, *d.* Yeldham Honour 2nd 12951 *by* Yeldham Pan 5215.

135 II. £10.—Fred Walker, Broadmead, Burstow, Horley, Surrey, for **Sutton Star 1660**, born in 1932 [foal *by* Furnival Cullinan 6387], bred by R. A. Forrest, Sutton, Woodbridge; *s.* Bawdsey Martian 6029, *d.* Raveningham Dawn 11757 *by* Sudbourne Foch 4869.

129 III. £5.—J. A. Marsden Popple, Daneshill, Stevenage, for **Wildham Arabis 15628**, born in 1929 [foal by Riddlesworth Cornet 6251], bred by H. S. Horne, Aldsworth; *s.* Bawdsey Kwang Su 5700, *d.* Coney Weston Arabis 12970 *by* Sudbourne Arabi 3287.

133 IV. £4.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Wratting Empress 15236**, born in 1928 [foal *by* Red Gold of Wratting 5932]; *s.* Bawdsey Emperor 5717, *d.* Nortoneau Di 12937 *by* Fakenham Peter 5053.

131 R.N.—Sir Cuthbert Quilter, Bart., Bawdsey, Woodbridge, for **Bawdsey Secern.**
H.C.—125.

Class 24.—*Suffolk Colt Foals, the produce of Mares in Class* 23.[2]

139 I. £10.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for foal, born March 6, 1936; *s.* Woolverstone Beaufort 6126, *d.* Wratting Betty 16367 *by* Worlingham Red Gold 5506.

140 II. £5.—Fred Walker, Broadmead, Burstow, Horley, Surrey, for foal, born Feb. 20, 1936; *s.* Furnival Cullinan 6387, *d.* Sutton Star 16660 *by* Bawdsey Martian 6029.

138 III. £3.—Mrs. R. G. Burden, Elm Tree Farm, Stapleton, Bristol, for **Clevedon Rex 6629**, born April 24, 1936; *s.* Shotley Counterpart 4903, *d.* Grove Lady Juanita 15534 *by* Bawdsey Wassail 5132.

137 R.N.—Lt.-Col. F. G. G. Bailey, Lake House, Salisbury, for **Lake Magog 6627**, born May 12, 1936; *s.* Broxted Duke 6226, *d.* Kesgrave Moggy 14969 *by* Woolverstone Checkmate 4683.

Class 25.—*Suffolk Filly Foals, the produce of Mares in Class* 23.[2]

142 I. £10.—J. A. Marsden Popple, Daneshill, Stevenage, for **Daneshill Arabis**, born March 26, 1936; *s.* Riddlesworth Cornet 6251, *d.* Wildham Arabis 15628 *by* Bawdsey Kwang Su 5700.

144 II. £5.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for foal, born Jan. 25, 1936; *s.* Red Gold of Wratting 5932, *d.* Wratting Empress 15236 *by* Bawdsey Emperor 5717.

143 III. £3.—Sir Cuthbert Quilter, Bart., Bawdsey, Woodbridge, for foal, born Feb. 18, 1936; *s.* Bawdsey Worcester 6150, *d.* Bawdsey Secern 16896 *by* Bawdsey Martian 6029.

145 R.N.—Fred Walker, Broadmead, Burstow, Horley, Surrey.

Class 26.—*Suffolk Mares, born in or before* 1932, *not having a foal at foot. A Mare* 6 *years old or over must have produced a live foal in* 1935 *or* 1936.[2]

149 I. £15.—R. H. & R. Paul, Broxtead, Sutton, Woodbridge, for **Broxtead Julia 16803**, born in 1932; *s.* Horstead Vanguard 4784, *d.* Swardeston Jiffy 12227 *by* Sudbourne Chieftain 5029.

150 II. £10.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Elmah of Wratting 16863**, born in 1932, bred by S. E. Cordle, Hill Farm, Chelmondiston, Ipswich; *s.* Riddlesworth Satrap 6048, *d.* Blossom 10310 *by* Woolverstone Checkmate 4683.

151 III. £5.—Frank Sainsbury, for **Vignette 15656**, born in 1929 [filly foal born March 15, 1935, *by* Red Gold of Wratting 5932], bred by W. H. Allen, Harkstead Hall, Ipswich; *s.* Fornham Beatty 4942, *d.* Lilly 10770 *by* Sudbourne Beauchief 4215.

148 R.N.—Mrs. R. G. Burden, Elm Tree Farm, Stapleton, Bristol, for **Rusper Princess 2nd.**

Class 27.—*Suffolk Fillies, born in* 1933.

152 I. £20 & Champion.[1]—P. Adams & Sons, Laurel Farm, Felixstowe, for **Laurel Golden Girl 17217**; *s.* Bawdsey Sir Roger 5970, *d.* Laurel Beauty 15361 *by* Shotley Counterpart 4903.

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[1] Champion Prize of £10 given by the Suffolk Horse Society for the best Mare or Filly.
[2] Prizes given by the Suffolk Horse Society.

156 II. £10.—Sir Cuthbert Quilter, Bart., Bawdsey, Woodbridge, for **Bawdsey Virginia** 17339; *s.* Boulge Sailor 5914, *d.* Bawdsey Zia 13688 *by* Sudbourne Foch 4869.
154 III. £5.—R. H. & R. Paul, Broxtead, Sutton, Woodbridge, for **Broxtead Jane** 17324; *s.* Broxtead Judex 6227, *d.* Broxtead Jean 15037 *by* Broxtead Harvester 5805.
157 R.N.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Wratting Doris.**

Class 28.—*Suffolk Fillies, born in* 1934.

168 I. £20.—Ernest Braithwaite Savory, Warren Farm, Streatley, Berks., for **Morston Bloom** 18001, bred by the late A. T. Pratt, Morston Hall, Trimley, Ipswich; *s.* Tattingstone Beau Esprit 4927, *d.* Morston Faithful 13177 *by* Shotley Counterpart 4903.
158 II. £10.—T. J. Bailey, Hill Farm, Roxwell, Essex, for **Roxwell Lady** 17538; *s.* Riddlesworth Satrap 6048, *d.* Morston Counter Peace 2nd 15710 *by* Shotley Counterpart 4903.
164 III. £5.—R. H. & R. Paul, Broxtead, Sutton, Woodbridge, for **Broxtead Diana** 17545; *s.* Broxtead Vanguard 6303, *d.* Frettenham Duchess 12912 *by* Sudbourne Chieftain 5029.
160 IV. £4.—The Earl of Iveagh, C.B., C.M.G., Pyrford Court, Woking, for **Pyrford Polity** 17703; *s.* Rushmere Ringleader 6040, *d.* Glitter 10006 *by* Morston Gold Guard 4234.
169 R.N.—Miss E. Unwin, Palmers, Billingshurst, Sussex, for **Raveningham Arabelle.**
H.C.—165. C.—159, 162, 166, 167.

Class 29.—*Suffolk Fillies, born in* 1935.

176 I. £20.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Wratting Fiancee** 18452; *s.* Bawdsey Dear Sir 6228, *d.* Wratting Nancy 16372 *by* Worlingham Red Gold 5506.
177 II. £10.—Frank Sainsbury, for **Wratting Starlight** 18458; *s.* Woolverstone Beaufort 6126, *d.* Raveningham Silver Star 14499 *by* Raveningham Cider Cup 5326.
172 III. £5.—Clement Cook, Upland Hall Farm, Bungay, Suffolk, for **Bungay Priscilla** 18721; *s.* Sudbourne Premier 4963, *d.* Graceful 10406 *by* Kenton Angus 4639.
175 R.N.—Sir Cuthbert Quilter, Bart., Bawdsey, Woodbridge, for **Bawdsey Shamrock.**
H.C.—171. C.—174.

Class 30.—*Suffolk Geldings, by registered sires, born in or before* 1933.[1]

181 I. £20.—Stuart Paul, Kirton Lodge, Ipswich, for **Captain,** born in 1930, bred by C. P. Runnacles, Brockdish Grove, Diss; *s.* Admiral John 5127, *d.* Reydon Diamond 13474 *by* Framlingham Beau 4737.
184 II. £10.—Stuart Paul, for **Short,** born in 1932, bred by Mrs. B. Taylor, Lavenham Hall, Suffolk; *s.* Morston Count 5928, *d.* Lavenham Surprise 13240 *by* Tattingstone Count 4494.
183 III. £5.—Stuart Paul, for **Major,** born in 1931, bred by Frank Warren, Godbolts, Marks Tey; *s.* Godbolts Hero 6027, *d.* Bonnie Sheika 11467 *by* Darsham Sheik 4129.
187 R.N.—Sir Cuthbert Quilter, Bart., Bawdsey, Woodbridge, for **Chief,** born in 1932.
H.C.—182. C.—179, 185.

Class 31.—*Teams of Three or Four Suffolk Horses, mares, geldings or mixed, in harness with vehicle.*

189 I. £10.—Stuart Paul, for Team of Four Geldings.
190 II. £5.—Frank Sainsbury, for Team of Four Mares.
188 III. £3.—Lt.-Col. F. G. G. Bailey, Lake House, Salisbury, for Team of Four.

Percherons.

Class 32.—*Percheron Stallions, born in or before* 1933.

196 I. £20 & Champion.[2]—J. Pierpont Morgan, Wall Hall, Aldenham, Watford, for **Echevin,** B. 574, light grey, born in 1926, bred by M. Champion, Mortagne, France; *s.* Vassal F. 154217, *d.* Alma F. 159437 *by* Remonteur F. 13485.
192 II. £10.—Sydney J. Cole, Heywood Hall, Diss, Norfolk, for **Stourhead Lagor 2nd** B. 555, light grey, born in 1932, bred by Sir Henry H. A. Hoare, Bart., Stourhead, Zeals, Wilts.; *s.* Stourhead Lagor B. 424, *d.* Stourhead Rosalind B. 357 *by* Orlando B. 49.
194 III. £5.—W. Drury & Sons, Postland, Crowland, Peterborough, for **Jantier** B. 608, dapple grey, born in 1931, bred by M. Bonlay, La Fauvelliere, France; *s.* Complet F. 167449, *d.* Unisexualite F. 147033 *by* Patrice F. 124730.
191 R.N.—Lord Brocket, Brocket Hall, Welwyn, Herts., for **Erpingham Thor.**
H.C.—195.

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[1] Prizes given by the Suffolk Horse Society.

[2] Perpetual Silver Challenge Cup given by the British Percheron Horse Society for the best Stallion.

Class 33.—*Percheron Stallions, born in* 1934.

198 I. £20, R.N. for Champion,[1] & Champion.[2]—CHIVERS & SONS, LTD., Histon, Cambridge, for Histon Bright Boy B. 640, dark grey; *s.* Carburateur B. 403, *d.* Histon Bright Star B. 979 *by* Cense B. 409.

200 II. £10.—SIR HENRY H. A. HOARE, BART., Stourhead, Zeals, Wilts., for Stourhead Gog 2nd B. 632, grey; *s.* Stourhead Lagor B. 424, *d.* Tirelire B. 434 *by* Instar F. 78857.

199 III. £5.—SYDNEY J. COLE, Heywood Hall, Diss, for Aldenham Monarch B. 630, dark grey, bred by J. Pierpont Morgan, Wall Hall, Aldenham, Watford; *s.* Orton Misanthrope B. 474, *d.* Greyling Welcome B. 443 *by* Rhum B. 53.

202 R.N.—J. PIERPONT MORGAN, Wall Hall, Aldenham, Watford, for Aldenham Servitor.
C.—201.

Class 34.—*Percheron Stallions, born in* 1935.

206 I. £20 & R.N. for Champion.[2]—SYDNEY J. COLE, Heywood Hall, Diss, for Hobland Prince B. 623, grey, bred by Thomas Cook, Hobland House, Bradwell, Norfolk; *s.* Greyling Xenophon B. 234, *d.* Sandouville B. 425 *by* Ostabat F. 123735.

205 I. £10.—CHIVERS & SONS, LTD., Histon, Cambridge, for Histon Vigilant B. 667, black; *s.* Coldham Gunner B. 208, *d.* Histon Vigil B. 1049 *by* Onuphre B. 43.

209 III. £5.—J. PIERPONT MORGAN, Wall Hall, Aldenham, Watford, for Aldenham Diplomat B. 668, dark grey; *s.* Histon Drayman 4th B. 340, *d.* Evenlode Deborah B. 698 *by* Evenlode Valient B. 133.

203 R.N.—CHIVERS & SONS, LTD., for Histon Bellman.
C.—207, 208.

Class 35.—*Percheron Mares, with their own foals at foot.*

210 I. £20 & Champion.[3]—THE BIRDSALL ESTATES CO., LTD., Birdsall, Malton, for Grosse B. 1136, dark grey, born in 1928 [foal *by* Aldenham Dodger 8549], bred by M. Durand, Montagne, France; *s.* Apre F. 155094, *d.* Craneuse F. 165899 *by* Souvenons F. 136704.

212 II. £10 & R.N. for Champion.[3]—CHIVERS & SONS, LTD., Histon, Cambridge, for Iodee B. 1171, grey, born in 1930 [foal *by* Duverner B. 573], bred by M, Jardin, Nogent-le-Rotrou, France; *s.* Dolichotis F. 173216, *d.* Dryade F. 172453 *by* Ulric F. 146915.

213 III. £5.—J. PIERPONT MORGAN, Wall Hall, Aldenham, Watford, for Aldenham Mylady B. 1096, very dark grey, born in 1932 [foal *by* Echevin B. 574]; *s.* Histon Drayman 4th B. 340, *d.* Histon Lady 6th B. 835 *by* Mylord B. 275.

Class 36.—*Percheron Colt or Filly Foals, the produce of Mares in Class* 35.

214 I. £10.—THE BIRDSALL ESTATES CO., LTD., Birdsall, Malton, for Birdsall Grilse B. 1369, dark grey filly, born March 9, 1936; *s.* Aldenham Dodger B. 549, *d.* Grosse B. 1136 *by* Apre F. 155094.

215 II. £5.—CHIVERS & SONS, LTD., Histon, Cambridge, for grey colt, born March 22, 1936; *s.* Duverner B. 573, *d.* Iodee B. 1171 *by* Dolichotis F. 173216.

216 III. £3.—J. PIERPONT MORGAN, Wall Hall, Aldenham, Watford, for dark grey colt, born April 2, 1936; *s.* Echevin B. 574, *d.* Aldenham Mylady B. 1096 *by* Histon Drayman 4th 340.

Class 37.—*Percheron Mares, not having a foal at foot, or Fillies, born in or before* 1933. *A Mare* 6 *years old or over must have produced a live foal in* 1935 *or* 1936.[4]

219 I. £20.—J. PIERPONT MORGAN, Wall Hall, Aldenham, Watford, for Florence B. 1024, light grey, born in 1927 [filly foal born April 4, 1935, *by* Histon Drayman 4th B. 340], bred by Mme. Vve. Burin, Mamers, France; *s.* Qualmin F. 129648, *d.* Partition F. 127469 *by* Importum F. 80576.

217 II. £10.—CHIVERS & SONS, LTD., Histon, Cambridge, for Histon Rosalind B. 1046, light grey, born in 1931; *s.* Cense B. 409, *d.* Rovigno B. 256 *by* Mylord B. 275.

218 III. £5.—SYDNEY J. COLE, Heywood Hall, Diss, for Lutecia B. 1300, light grey, born in 1933, bred by M. Lemelin, Alencon, France; *s.* Fugolin F. 108182, *d.* Fuite F. 183821 *by* Arenuleux F. 156672.

220 R.N.—J. PIERPONT MORGAN, for Whitehall Vanessa.

Class 38.—*Percheron Fillies, born in* 1934.

227 I. £20.—SYDNEY J. COLE, Heywood Hall, Diss, for Merveille B. 1372, grey, bred by M. Vaux, Montagne, France; *s.* Genet F. 187676, *d.* Ubiette F. 148809 *by* Quanteleux F. 131765.

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[1] Perpetual Silver Challenge Cup given by the British Percheron Horse Society for the best Stallion.

[2] Perpetual Silver Challenge Cup given by the British Percheron Horse Society for the best Stallion in Classes 33 and 34 born in Great Britain.

[3] Perpetual Silver Challenge Cup given by the British Percheron Horse Society for the best Mare or Filly.

[4] Prizes given by the British Percheron Horse Society.

225 **II. £10 & Champion.**[1]—Chivers & Sons, Ltd., Histon, Cambridge, for **Histon Reveille** B. 1278, dark grey; *s.* Cense B. 409, *d.* Histon Trip B. 279 *by* Oremus B. 13.
226 **III. £5.**—Sydney J. Cole, for **Malachie** B. 1371, grey, bred by M. Baillon, Mamers, France; *s.* Halbran F. 188548, *d.* Fleche F. 182808 *by* Abocatier F. 159232.

224 **R.N. & R.N. for Champion.**[1]—Chivers & Sons, Ltd., for **Histon Bonny Maid** B. 1272, grey; *s.* Cense B. 409, *d.* Histon Bonny 2nd B. 879 *by* Mylord B. 275.
H.C.—229. C.—221, 230.

Class 39.—*Percheron Geldings, by registered sires, born in or before* 1933.[2]

232 **I. £20.**—Chivers & Sons, Ltd., Histon, Cambridge, for **Captain**, grey, born in 1930, bred by Ashley Bros., Godmanchester, Hunts.; *s.* Cense B. 409.
233 **II. £10.**—Chivers & Sons, Ltd., for **Duke**, grey, born in 1929, bred by E. Guy Fenwick, North Luffenham Hall, Stamford; *s.* Misanthrope B. 5.

Class 40.—*Teams of Three or Four Percheron Horses, stallions, mares, geldings or mixed, in harness with vehicle.*

235 **I. £10.**—Chivers & Sons, Ltd., for Team of Four.
236 **II. £5.**—J. Pierpont Morgan, for Team of Four Mares.

Hunters.

Class 41.—*Hunter Geldings, born in* 1933.

237 **I. £20.**—Captain and Mrs. Francis T. Hill, Boarded Barns, Ongar, Essex, for **Jerkin** (Supp. No. 1940), brown; *s.* Celebrate, *d.* Jenny Firkin *by* Grand Parade.
243 **II. £10.**—Miss Schroder, Dell Park, Englefield Green, Surrey, for **Hotspur**, bay; *s.* Golden Pine, *d.* Larkspur.
245 **III. £5.**—Major W. Harcourt Webb, Spring Grove, Bewdley, for **Pay Day** (Supp. No. 1839), bay, bred by Mrs. W. Harcourt Webb; *s.* Bhuidhaonach, *d.* Lady Day *by* Marint.

240 **R.N.**—John Edward Jones, Treworgan, Llangrove, Hereford, for **Royal Flush**.
H.C.—246.

Class 42.—*Hunter Geldings, born in* 1934.

253 **I. £20 & R.N. for Champion.**[3]—Major Gordon B. Foster, Leysthorpe, Oswaldkirk, York, for **Fire Fly**, chestnut; *s.* Aynsley, *d.* 7464 Dragon Fly *by* Dunholm.
251 **II. £10.**—Mrs. Philip Fleming, Barton Abbey, Steeple Aston, Oxford, for **Redwine** (Supp. No. 1988), bay; *s.* Pal-o'-Mine, *d.* 7288 Redwing 7th *by* Red Hand.
249 **III. £5.**—F. R. Bennion, Bellamy's, Greenway, Ledbury, for **Gay Lad**, chestnut; *s.* Sky Cracker, *d.* Dainty *by* Gay Lally.

254 **R.N.**—Mrs. H. Frank, Saddlewood, Wotton-under-Edge, for **Raggles**.

Class 43.—*Hunter Colts or Geldings, born in* 1935.

259 **I. £20.**—Hector G. Franklin, Mendip House, Cheddar, Somerset, for **Hythe**, chestnut colt; *s.* Double Bed, *d.* Belah *by* Determination.
260 **II. £10.**—Mrs. Howard Mander, Trysull Manor, Wolverhampton, for **Buddha**, bay colt, bred by E. Craig Tanner, Eyton-on-Severn; *s.* Bhuidhaonach, *d.* Muz *by* Cylden.
266 **III. £5.**—Lt.-Col. C. E. Turner, D.S.O., Old Down, Tockington, Bristol, for **Showman**, bay gelding; *s.* Mountain Lad, *d.* Shaw Sheen.

267 **R.N.**—Mrs. J. T. Wigan, Danbury Park, Chelmsford, for **Where is She**.

Class 44.—*Hunter Fillies, born in* 1933.

270 **I. £20 Champion[3] & Champion.**[4]—J. Steel, Kirkwood, Lockerbie, for **8203 Speedway**, brown; *s.* Hot Haste, *d.* Dinah *by* Sandstone.
269 **II. £10.**—Mrs. Malcolm Oxley, Ashton House, Ashton Keynes, Wilts., for **Sister Ann**, bay; *s.* Far and Sure.
268 **III. £5.**—Lord Digby, D.S.O., M.C., Minterne, Dorchester, for **8302 Austin Seven**, chestnut; *s.* Austin Friars, *d.* 8800 Precioso *by* Kendal Brown.
271 **R.N.**—Major G. Wheler, Ledston Hall, Castleford, Yorks., for **Quick Change**.

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[1] Perpetual Silver Challenge Cup given by the British Percheron Horse Society for the best Filly born in Great Britain.

[2] Prizes given by the British Percheron Horse Society.

[3] Silver Challenge Cup given through the Hunters' Improvement and National Light Horse Breeding Society for the best young Hunter in Classes 41 to 46, 49 and 50.

[4] Champion Gold Medal given by the Hunters' Improvement and National Light Horse Breeding Society for the best Filly under four years old, which must be either registered in the Hunter Stud Book, or the entry tendered within a month of the Award.

Class 45.—*Hunter Fillies, born in* 1934.

274 I. £20.—Mrs Howard Mander, Trysull Manor, Wolverhampton, for **Betty Jones**, bay, bred by Glendower Jones, Craven Arms; *s.* Friar, *d.* 6215 Betty 4th *by* Red Sahib.

275 II. £10.—Lord Stavordale, Evershot, Dorset, for **8515 Bridget 15th**, bay, bred by Exhibitor and the Countess of Ilchester, Melbury House, Dorset; *s.* Brisl, *d.* 8321 Dolly 11th *by* Monfin.

273 III. £5.—The Hon. Mrs. Lopes, Sandridge Park, Melksham, for **8229 Beeswing 2nd**, iron grey; *s.* Hafiz, *d.* 7832 Fleet Wing *by* Book.

Class 46.—*Hunter Fillies, born in* 1935.

288 I. £20 & R.N. for Champion.[1]—J. Steel, Kirkwood, Lockerbie, for **8488 Streamline**, dark chestnut; *s.* Hot Haste, *d.* Dinah *by* Sandstone.

279 II. £10.—Lord Digby, D.S.O., M.C., Minterne, Dorchester, for **8303 Orthia**, brown; *s.* Orthos, *d.* 7331 Kittywinks *by* Kingsborough.

278 III. £5.—Miss Busfeild, Raysfield Farm, Chipping Sodbury, for **8537 Mountain Lass**, bay, bred by W. James, Plough Farm, Cross Hands, Chipping Sodbury; *s.* Mountain Lad.

281 R.N.—Mrs. Howard Mander, Trysull Manor, Wolverhampton, for **Mary Ann.**
H.C.—277.

Class 47.—*Hunter Mares (Novice), with their own foals at foot.*

290 I. £20 & R.N. for Champion.[2]—J. R. Baker, Bickham, Roborough, Devon, for **7995 Lyndridge Miss Impatience**, chestnut, born in 1931 [foal *by* Buchan], bred by Mrs. V. Thomas, Okehampton; *s.* Pytchley, *d.* 7290 Martrine *by* Marten.

300 II. £10.—John Stubbs, Hessle Farm, Wragby, Wakefield, for **7700 Bracelet 2nd**, chestnut, born in 1928 [foal *by* Warrington], bred by J. W. Peirson, Yatts Farm, Pickering, Yorks.; *s.* Monte Faro, *d.* May Flower *by* Baal-Gad.

291 III. £5.—Miss Busfeild, Raysfield Farm, Chipping Sodbury, for **8041 Exception**, bay, born in 1928 [foal *by* Kentish Knock], bred by David Dunlea, Bridgehouse, Castletownroche, Mallow, Co. Cork; *s.* Desborough, *d.* *by* Crackenthorpe.

293 IV. £4.—Lord Digby, D.S.O., M.C., Minterne, Dorchester, for **Baby Austin**, chestnut, born in 1932 [foal *by* Brisl]; *s.* Austin Friars, *d.* 7036 Friarsgown *by* Friarsgate.

295 R.N.—E. G. MacAndrew, Pallinghurst, Baynards, Horsham, for **Polly.**

Class 48.—*Hunter Mares, with their own foals at foot.*

303 I. £20 & Champion.[2]—Mrs. H. Frank, Saddlewood, Wotton-under-Edge, for **6505 Rosemary 3rd**, bay, born in 1925 [foal *by* Mankato]; *s.* Mount William, *d.* 6415 Janie 2nd.

290 II. £10.—J. R. Baker, for **Lyndridge Miss Impatience.** [See Class 47].

302 III. £5.—Lord Digby, D.S.O., M.C., Minterne, Dorchester, for **7331 Kittywinks**, black, born in 1929 [foal *by* Brisl]; *s.* Kingsborough, *d.* 7114 Kitty 21st.

304 R.N.—Geoff. Kenyon, Armscote, Stratford-on-Avon, for **Mistletoe 5th.**

Class 49.—*Hunter Colt Foals, the produce of Mares in Classes* 47 *and* 48.

310 I. £15.—John Stubbs, Hessle Farm, Wragby, Wakefield, for bay, born March 20, 1936; *s.* Warrington, *d.* 7700 Bracelet 2nd *by* Monte Faro.

308 II. £10.—Mrs' H. Frank, Saddlewood, Wotton-under-Edge, for bay, born April 30, 1936; *s.* Mankato, *d.* 6505 Rosemary 3rd *by* Mount William.

306 III. £5.—Lord Digby, D.S.O., M.C., Minterne, Dorchester, for **Accession Day**, chestnut, born Jan. 22, 1936; *s.* Plantago, *d.* African Dance *by* Spion Kop.

307 R.N.—Lord Digby, D.S.O., M.C., for **Bush Baby.**

Class 50.—*Hunter Filly Foals, the produce of Mares in Classes* 47 *and* 48.

315 I. £15.—Geoff. Kenyon, Armscote, Stratford-on-Avon, for **Eclair**, chestnut, born April 21, 1936; *s.* Ecilath, *d.* 8326 Mistletoe 5th *by* Maccanna.

312 II. £10.—J. R. Baker, Bickham, Roborough, Devon, for bay, born April 6, 1936; *s.* Buchan, *d.* 7995 Lyndridge Miss Impatience *by* Pytchley.

316 III. £5.—E. G. MacAndrew, Pallinghurst, Baynards, Horsham, for chestnut, born April 23, 1936; *s.* Blunderer, *d.* Polly *by* Little Marten.

314 R.N.—Lord Digby, D.S.O., M.C., Minterne, Dorchester, for **Briskit.**

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[1] Champion Gold Medal given by the Hunters' Improvement and National Light Horse Breeding Society for the best Filly under four years old, which must be either registered in the Hunter Stud Book, or the entry tendered within a month of the Award.

[2] Champion Gold Medal given by the Hunters' Improvement and National Light Horse Breeding Society for the best Mare four years old and upwards, which must be either registered in the Hunter Stud Book, or the entry tendered within a month of the Award.

Polo and Riding Ponies.

Class 51.—*Polo and Riding Pony Stallions, born in or before* 1933.

322 **I. £20 & Champion.**[1]—Capt. W. H. France-Hayhurst, Bostock Hall, Middlewich, for **Silverdale Loyalty 1448**, dark brown, born in 1923, bred by H. Bright, The Cove, Silverdale, Carnforth; *s.* Prince Friarstown (Supp., 1917), *d.* 4168 Silvery 2nd *by* Right For'ard 368.

320 **II. £10 & R.N. for Champion.**[1]—H. Bright, The Cove, Silverdale, Carnforth, for **Silverdale Tarragon 1918**, chestnut, born in 1930; *s.* Tabarin 1682, *d.* 3388 Bowery *by* Bowdon.

323 **III. £5.**—John Jones & Son, Dinarth Hall, Colwyn Bay, for **Friar 1381**, black, born in 1922, bred by Lady Penrhyn, Wicken Park, Stony Stratford; *s.* Prince Friarstown (Supp., 1917), *d.* Hannah Ann (A.M.R., p. 45).

321 **R.N.**—Miss B. G. Cory-Wright, The Golden Parsonage, Hemel Hempstead, for **Ethelwulf.**
H.C.—324.

Class 52.—*Polo and Riding Pony Colts, Fillies or Geldings, born in* 1935.

330 **I. £20.**—Capt. W. H. France-Hayhurst, Bostock Hall, Middlewich, for **Corona 3rd** (Supp., 1935), chestnut colt; *s.* Four Up [Vol. 25, p. 1033], *d.* 6203 Coroline *by* Rosewood 1314.

326 **II. £10 & R.N. for Champion.**[2]—H. Bright, The Cove, Silverdale, Carnforth, for **Silverdale Betonia** (Supp., 1936), bay filly; *s.* Silverdale Tarragon 1918, *d.* 5813 Silverdale Betula *by* Cherry Tint 761.

334 **III. £5.**—Sir Ian Walker, Bart., Osmaston Manor, Derby, for **Jemima** (Supp., 1935), chestnut filly; *s.* Knight Error, *d.* Cosima (Supp., 1931) *by* Tabarin 1682.

333 **R.N.**—Edward Hurtley, Crowborough Warren, Sussex, for **Ilicifolia.**
H.C.—325.

Class 53.—*Polo and Riding Pony Colts, Fillies or Geldings, born in* 1934.

338 **I. £20.**—Tresham Gilbey, Whitehall, Bishops Stortford, for **Amber** (Supp. 1934), chestnut gelding; *s.* Crathorne (Supp., 1929), *d.* Emerald 3rd (A.M.R., p. 248).

336 **II. £10.**—Capt. W. H. France-Hayhurst, Bostock Hall, Middlewich, for **Roselite** (Supp., 1934), grey gelding; *s.* Four Up [Vol. 25, p. 1033], *d.* 6026 Rosine *by* Rosewood 1314.

341 **III. £5.**—H. A. Tiarks, Webbington House, Axbridge, for **Potato** (Y.S.B., p. 197), chestnut colt; *s.* Mankato, *d.* Peach 3rd (A.M.R., p. 471) *by* Clarendon.

342 **R.N.**—Sir Ian Walker, Bart., Osmaston Manor, Derby, for **Delight 5th.**
H.C.—335, 340.

Class 54.—*Polo and Riding Pony Fillies or Geldings, born in* 1933.

344 **I. £20, Champion[2] & Champion.**[3]—H. Bright, The Cove, Silverdale, Carnforth, for **Silverdale Nessie** (Supp., 1934), bay filly, bred by A. Bennett, Halforth Farm, Heversham, Westmorland; *s.* Silverdale Cheerio 1320, *d.* Lochranza (A.M.R., 355) *by* Loch Ryan.

345 **II. £10.**—Mrs. J. Oscar Muntz, Foxhams, Horrabridge, Devon, for **Silver Ray** (Supp., 1933), bay filly; *s.* Love Song 1065, *d.* 5224 Early Market *by* Yorkshire Hussar 813.

Class 55.—*Polo and Riding Pony Mares, with their own foals at foot.*

354 **I. £20 & R.N. for Champion.**[3]—Mrs. J. Oscar Muntz, Foxhams, Horrabridge, Devon, for **6037 Stolen Love**, chestnut, born in 1925 [foal *by* Early Love 1954]; *s.* Love Song 1065, *d.* 2571 Robbery *by* Gold Medallist.

349 **II. £10 & R.N. for Champion.**[4]—H. Bright, The Cove, Silverdale, Carnforth, for **6681 Silverdale Sepia**, brown, born in 1925 [foal *by* Silverdale Tarragon 1918]; *s.* Silverdale Cheerio 1320, *d.* Parnassia (A.M.R., p. 85) *by* Count Schomberg.

353 **III. £5.**—Lady Margaret Drummond Hay, Ferne, Shaftesbury, for **Raheene** (A.M.R., p. 305, bay, born in 1923 [foal *by* Malice 1371], bred by Lord Greenway, Stangrove, Edenbridge; *s.* Raheene, *d. by* Agadir.

352 **R.N. & Champion.**[4]—Mrs. Jack Gouldsmith, Brook House, Dartington, Totnes, for **Lady Erin**, dun, born in 1927 [foal *by* Tabarin 1682], bred by Mrs. V. Thomas, Lyndridge, Okehampton; *s.* Lord Hilary, *d.* Shamrock.
H.C.—350. **C.**—346.

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[1] Champion Gold Medal given by the National Pony Society for the best Stallion or Colt.

[2] Champion Silver Medal given by the National Pony Society for the best Filly.

[3] Champion Gold Medal given by the National Pony Society for the best Mare or Filly.

[4] Bronze Medal given by the National Pony Society for the best Foal in Class 55 entered in the Supplement to the National Pony Stud Book.

Arabs.

Class 56.—*Arab Stallions, born in or before* 1932.[1]

355 I. £15.—H. V. M. Clark, Court House, Offham, Lewes, for **Saoud**, bay, born in 1926 ; *s.* Nimr, *d.* Safarjal *by* Berk.

357 II. £10.—George H. Ruxton, Craven Lodge, Monksherborne, Basingstoke, for **Algol** (Vol. 4, p. 23), chestnut, born in 1928, bred by His Majesty the King ; *s.* Aldebaran, *d.* Rangha *by* Berk.

358 III. £5.—R. S. Summerhays, 19, Eastcheap, London, E.C., for **Jaleel**, chestnut, born in 1927, bred by the Hon. Lady Wentworth, Crabbet Park, Sussex ; *s.* Naseem, *d.* Jawi Jawi *by* Rijm.

Class 57.—*Arab Stallions or Colts, born in* 1933, 1934 *or* 1935.

359 I. £15.—Mrs. Joan Stone, Rochdale Hotel, Bournemouth, for **Amaranthos**, light bay, born in 1934 ; *s.* Algol, *d.* Battla *by* Razaz.

362 II. £10.—Lady Yule, Hanstead House, Bricket Wood, St. Albans, for **Raktha** (Supp., 1934), grey, born in 1934 ; *s.* Naseem, *d.* Razina *by* Rasim.

361 III. £5.—Lady Yule, for **Grey Owl** (Supp., 1934), grey, born in 1934 ; *s.* Raseem, *d.* Naxina *by* Skowronek.

360 R.N.—R. E. L. Vaughan Williams, High Ashes Farm, Holmbury St. Mary, Dorking, for **El Ghazi.**

Class 58.—*Arab Fillies, born in* 1933, 1934 *or* 1935.

363 I. £15.—T. C. Armitage, Dene Court, Taunton, for **Algola**, chestnut, born in 1935 ; *s.* Algol (Vol. 4, p. 23), *d.* Sahra (Vol. 4, p. 171) *by* Crosbie (Vol. 3, p. 30).

366 II. £10.—Lady Yule, Hanstead House, Bricket Wood, St. Albans, for **Sulka** (Supp., 1934), chestnut, born in 1934 ; *s.* Naseem, *d.* Nurschida.

364 III. £5.—H. V. M. Clark, Court House, Offham, Lewes, for **Ruth**, chestnut, born in 1934 ; *s.* Atesh, *d.* Rangha *by* Berk.

365 R.N.—Lady Yule, for **Ghezala.**

Welsh Mountain Ponies.

Class 59.—*Welsh Mountain Pony Stallions, born in or before* 1933.

368 I. £15.—Tom Jones Evans, Dinchope Farm, Craven Arms, for **Grove Sprightly 1036**, grey, born in 1918, bred by Mrs. H. D. Greene, Grove, Craven Arms ; *s.* Bleddfa Shooting Star 73, *d.* 4431 Grove Sprite 2nd *by* Grove Ballistite 200.

369 II. £10.—Tom Jones Evans, for **Grove Will o' the Wisp 1260**, grey, bred by Mrs. H. D. Greene, Grove, Craven Arms ; *s.* Bleddfa Shooting Star 73, *d.* 3017 Grove Twilight *by* Grove Ballistite 200.

370 III. £5.—John Jones & Son, Dinarth Hall, Colwyn Bay, for **Bowdler Brightlight 1303**, grey, born in 1923, bred by G. Preece, Hope Bowdler, Church Stretton ; *s.* Mathrafal Havoc 909, *d.* 6880 Bowdler Bounce *by* Dyoll Satellite 386.

Class 60.—*Welsh Mountain Pony Mares, born in or before* 1932, *not having a foal at foot. A Mare* 6 *years old or over must have produced a live foal in* 1935 *or* 1936.

372 I. £15.—The Hon. Mrs. Devereux, Hampton Green Park, Leominster, for **8544 Grove Nightfall.**, grey, born in 1925 [colt foal born April 4, 1936, *by* Tregoyd Morning Star 1553[, bred by Mrs. H. D. Greene, Grove, Craven Arms ; *s.* Bleddfa Shooting Star 73, *d.* 6584 Grove Welsh Poppy *by* Emlyn Cymro Llwyd 868.

374 II. £10.—Misses May & Summers, Manor House, Rodney Stoke, Cheddar, for **8568 Towy Vale Delight**, brown, born in 1920 [filly foal born April 5, 1936, *by* Endymion, Supp., 1931], bred by the late W. S. Miller, Forest Lodge, Brecon ; *s.* Forest Chief 944, *d.* 6574 Forest Brave Lula *by* Forest Bravo 814.

373 III. £5.—Misses May & Summers, for **5992 Clumber Miss Mary**, grey, born in 1917 [filly foal born May 8, 1936, *by* Endymion, Supp., 1931], bred by the Duchess of Newcastle, Clumber Park, Worksop ; *s.* Hardwick Conqueror 668, *d.* 3758 Clumber Janet 3rd *by* Hardwick Sensation 670.

371 R.N.—Misses Calmady-Hamlyn & Dawson, Pearroc Vean, Buckfast, Devon, for **Vean Magic.**

H.C.—375.

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[1] Prizes given by the Arab Horse Society.

Shetland Ponies.

Class 61.—*Shetland Pony Stallions, not exceeding* 10½ *hands, born in or before* 1933.

381 I. £15 & Champion.[1]—Mrs. Maurice Cox, Marshwood Manor, Bridport, for **Rustic Sprite of Standen 1343**, black, born in 1929, bred by the late Lady Hobart, Standen House, Newport, Isle of Wight; *s.* Fairy Lamp 985, *d.* 4280 Rose Noble *by* Ivanhoe 658.

378 II. £10.—Mrs. G. E. Atkinson, Felbridge Park, East Grinstead, for **May Visier of Penniwells**, black, born in 1929, bred by Mrs. Etta Duffus, Penniwells, Elstree; *s.* Discoverer of Penniwells 1154, *d.* 4392 May Violet of Penniwells *by* Vagary of Penniwells 841.

382 III. £5.—Mrs. Maurice Cox, for **Venture of Marshwood 1236**, black, born in 1925; *s.* Bohemian of Earlshall 1072, *d.* Verona of Maryfield 3405.

376 R.N.—Mrs. G. E. Atkinson, for **Dimissory of Felbridge.**
H.C.—385. C.—383, 386.

Class 62.—*Shetland Pony Mares, not exceeding* 10½ *hands, born in or before* 1933, *not having a foal at foot. A Mare over* 4 *years old must have produced a live foal.*

390 I. £15 & R.N. for Champion.[1]—Mrs. E. M. Dick, Transy, Dunfermline, for **4551 Helsa of Transy**, black, born in 1926 [colt foal, born May 31, 1935, *by* Sophimore of Transy 1323], bred by William Mungall, Transy, Dunfermline; *s.* Pole Star 884, *d.* 4088 Helia of Transy *by* Pat of Transy 776.

387 II. £10.—Misses Calmady-Hamlyn & Dawson, Pearroc Vean, Buckfast, Devon, for **4388 Ashbank Gladio**, black, born in 1923 [colt foal born May 9, 1935, *by* Knave of Holme 1313], bred by Graham Clark, Ashbank, Aberdeen; *s.* Pimpo of Middlefield 1061, *d.* 4042 Gladys of Rosehaugh *by* Bertie of Dunecht 903.

391 III. £5.—Mrs. N. B. Ducker, Littlestoke Manor, North Stoke, Oxford, for **Snipe of Earlshall** (Vol. 40, p. 20), bay, born in 1932, bred by R. W. R. Mackenzie, Carpow, Fife; *s.* Gluss Norseman 759, *d.* 4101 Kirkbride Saucy Sue *by* Vesture of Earlshall 630.

389 R.N.—Mrs. Maurice Cox, Marshwood Manor, Bridport, for **4467 Bohemian Maid of Marshwood.**
H.C.—388.

Dartmoor Ponies.

Class 63.—*Dartmoor Pony Stallions, born in or before* 1933.

395 I. £5.—E. W. White & Son, Lambe House, South Zeal, Okehampton, for **Boxer**, dark bay, born in 1930; *s.* Punch, *d.* Sparklet 2nd.

394 II. £3.—Sydney Horrell, Bucktor, Yelverton, Devon, for **Sammy**, brown, born in 1933.

393 III. £2.—Master John Coaker, Great Sherberton, Princetown, for **Brownberry**, brown, born in 1929, bred by Pearce Bros., Meavy, Devon.

397 R.N.—Mrs. G. A. Wright, Yelfords, Chagford, Devon, for **Wee Devil.**
H.C.—396.

Class 64.—*Dartmoor Pony Mares, with their own foals at foot.*

398 I. £5.—Master John Coaker, Great Sherberton, Princetown, for **Heatherbelle**, bay, aged [foal *by* Brownberry], bred by His Majesty King George V; *s.* Jester.

399 II. £3.—E. W. White & Son, Lambe House, South Zeal, Okehampton, for **Queenie**, grey, born in 1928 [foal *by* Boxer 1801]; *s.* Grey Whithers, *d.* Fairy 3rd.

401 III. £2.—Mrs. G. A. Wright, Yelfords, Chagford, Devon, for **6540 May 5th**, chestnut, born in 1932 [foal *by* Wee Devil 1938], bred by F. Webber, East Week, Chagford; *s.* Dartmoor Hero, *d.* 6111 Victory Star.

400 R.N.—E. W. White & Son, for **Black Bess.**
H.C.—402.

Class 65.—*Dartmoor Pony Colts, Fillies or Geldings, born in* 1934 *or* 1935.

403 I. £5.—Master John Coaker, Great Sherberton, Princetown, for **Brown Belle**, bay filly, born in 1935, bred by J. Coaker; *s.* Brownberry, *d.* Heatherbelle *by* Jester.

408 II. £3.—E. W. White & Son, Lambe House, South Zeal, Okehampton, for **Fairy**, bay filly, born in 1935; *s.* Cawsand Beacon, *d.* Queenie *by* Gay Whithers.

410 III. £2.—Mrs. G. A. Wright, Yelfords, Chagford, Devon, for **6826 Folly 3rd**, brown filly, born in 1934, breeder unknown.

409 R.N.—Mrs. G. A. Wright, for **Black Prince 4th.**
H.C.—404, 411. C.—405, 406.

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[1] Champion Silver Medal given by the Shetland Pony Stud Book Society for the best Shetland Pony.

Class 66.—*Dartmoor Pony Mares or Geldings, not over* 12·2 *hands, born in or before* 1933. *To be ridden by a child born on or after July* 4, 1922.

414 I. £5.—MRS. PETER CAREW, Haccombe, Newton Abbot, for **Paintbox**, bay mare, born in 1929.

419 II. £3.—MRS. G. A. WRIGHT, Yelfords, Chagford, Devon, for **6574 Tawton Dart**, dark bay mare, born in 1933, bred by F. Webber, East Week, Chagford; *s.* Boxer 1801, *d.* 6111 Victory Star.

418 III. £2.—MRS. BEZZANT, Endon, Pershore, for **5608 Lyndridge Judy**, bay mare, born in 1925, bred by Mrs. Vinsor Thomas, Little Lyndridge, Okehampton; *s.* Cawsand Beacon 1302, *d.* 5257 Lyndridge Dartmoor Lady.

415 R.N.—MISS ANNE COAKER, Great Sherberton, Princetown, for **Patience.**
H.C.—412.

Exmoor Ponies.

Class 67.—*Exmoor Pony Stallions, born in or before* 1933.

421 I. £5.—W. G. THORNE & SON, Higher House, Twitchen, South Molton, for **Laddie 1249** (No. 1), bay, born in 1923.

420 II. £3.—WILLIAM CROCKFORD, Hawkwell Farm, Whedden Cross, Minehead, for **Joey 1872** (No. 14), light bay, born in 1931; *s.* No. 8, *d.* No. 6.

422 III. £2.—H. WILLIAMS & SON, Great Ash, Winsford, Minehead, for **Bradymoor No. 7**, brown, born in 1928; *s.* Bradymoor No. 1.

Class 68.—*Exmoor Pony Mares, with their own foals at foot.*

424 I. £5.—TOM PRING, Great Champson, Molland, South Molton, for **4345 Molland Gem 4485** (No. 4), brown, born in 1923 [foal *by* 1249 (No. 1)], bred by the late W. Pring, Winsford.

425 II. £3.—H. WILLIAMS & SON, Great Ash, Winsford, Minehead, for **Kitty 5714** (No. 3), brown, born in 1925 [foal *by* Bradymoor No. 7].

423 III. £2.—TOM PRING, for **Champsen Lady 4842** (No. 1), brown, born in 1919 [foal *by* 1249 (No. 1)], bred by the late W. Pring, Winsford.

Class 69.—*Exmoor Pony Colts, Fillies or Geldings, born in* 1934 *or* 1935.

427 I. £5.—WILLIAM CROCKFORD, Hawkwell Farm, Whedden Cross, Minehead, for **Tommy** (No. 19), brown colt, born in 1934.

426 II. £3.—WILLIAM CROCKFORD, for **Midget** (No. 15), bay mare, born in 1934.

428 III. £2.—MISSES DASHWOOD & SANDERS, Osgood's Holding, Bucklebury Common, Reading, for **Ashorne Badgeworthy**, brown filly, born in 1935, bred by S. J. Westcott, Zeals, Hawkridge, Dulverton.

430 R.N.—H. WILLIAMS & SON, Great Ash, Winsford, Minehead, for **Ashill.**

Class 70.—*Exmoor Pony Mares or Geldings, not over* 12·2 *hands, born in or before* 1933. *To be ridden by a child born on or after July* 4, 1922.

[No Exhibits].

Riding Classes.

HUNTERS.

Class 71.—*Hunter Mares or Geldings, born in* 1932.

451 I. £15.—HUGH SUMNER, Rashwood Court, Droitwich, for **Loyalist**, bay gelding, born in 1932.

445 II. £10.—GEOFF. KENYON, Armscote, Stratford-on-Avon, for **Knock Out**, chestnut gelding, born in 1932.

437 III. £5.—MRS. B. A. HAMILTON, 48, Eresby House, Rutland Gate, London, S.W. for **Mr. Loose**, chestnut gelding, born in 1932.

449 IV. £3.—LT.-COL. BRIAN W. ROBINSON, M.C., Peewits Hill, Cirencester, for **Red Mike 2036**, chestnut gelding, born in 1932, bred by Pierce Curtin, Rathcormac, Fermoy, Ireland; *s.* Giolla Ruadh, *d. by* Cock Horse.

432 R.N.—THE EARL OF BRADFORD, Weston Park, Shifnal, for **Moonstone.**

Class 72.—*Hunter Mares or Geldings (Novice), born in or before* 1932, *up to from* 12 *to* 14 *stones,*

451 I. £15.—HUGH SUMNER, for **Loyalist.** (See Class 71.)

466 II. £10.—J. V. RANK, Ouborough, Godstone, Surrey, for **Cottisford**, chestnut gelding, born in 1930.

462 III. £5.—MRS. R. MACPHERSON-LAWRIE, Newnton Priory, Tetbury, Glos., for **Frederick Charles**, brown gelding, born in 1930.

437 IV. £3.—MRS. B. A. HAMILTON, for **Mr. Loose.** (See Class 71.)

469 R.N.—SIR STANLEY W. TUBBS, BART., Ellerncroft, Wotton-under-Edge, for **Bandit.**
H.C.—454.

Class 73.—*Hunter Mares or Geldings (Novice), born in or before* 1932, *up to more than* 14 *stones.*

449 I. £15.—Lt.-Col. Brian W. Robinson, M.C., for **Red Mike.** (See Class 71.)
439 II. £10.—J. R. Hindley, Moorlands, Blacko, Nelson, Lancs., for **Benedict,** grey gelding, born in 1928 or 1929.
494 III. £5.—W. Devereux, Meads, Stoke Park, Stoke Poges, Bucks., for **Gold Dust,** chestnut gelding, born in 1931, bred by M. O'Brien, Clashmore, Ireland; *s.* Servitude, *d. by* Perfection.
473 IV. £3.—Mrs. H. Josephine H. Fleming, Cricket Court, Cricket Malherbre, Ilminster, for **Sir Standun,** brown gelding, born in 1931.

Class 74.—*Hunter Mares or Geldings, born in or before* 1931, *up to not more than* 14 *stones, suitable to carry a Lady, and to be ridden by a Lady, side-saddle.*

491 I. £15.—Mrs. D. Wilson, The Thatched House, Stratton Audley, Bicester, for **Perfection,** bay gelding, born in 1929, bred by W. Cotter, Rathcormac, Ireland; *s.* Perfect Knight, *d. by* Cock Horse.
486 II. £10.—B. A. Selby, The Garden Cottage, The Goffs, Eastbourne, for **Ballymonis,** brown gelding, born in 1929, bred by W. Lonergan, Neddius, Ardfinnan, Tipperary; *s.* Santavon, *d. by* Sir Edgar.
485 III. £5.—B. A. Selby, for **All Phalorn,** liver chestnut gelding, born in 1930.
481 IV. £3.—The Hon. Mrs. Fred H. Cripps, Moor Farm, Lane End, Bucks., for **Mino Tubs,** chestnut gelding, born in 1929, bred by T. Keating, Nicholstown Castle, Cahir, Tipperary; *s.* Iron Hand, *d.* Rushmount *by* Battleaxe.
489 R.N.—Mrs. H. Spalding, Barrow-on-Soar, Leics., for **B.P.**

Class 75.—*Hunter Mares or Geldings, born in or before* 1932, *up to from* 12 *to* 13·7 *stones.*

486 I. £20.—B. A. Selby, for **Ballymonis.** (See Class 74.)
491 II. £15.—Mrs. D. Wilson, for **Perfection.** (See Class 74.)
485 III. £10.—B. A. Selby, for **All Phalorn.** (See Class 74.)
466 IV. £5.—J. V. Rank, for **Cottisford.** (See Class 72.)
481 V. £3.—The Hon. Mrs. Fred H. Cripps, for **Mino Tubs.** (See Class 74.)
462 R.N.—Mrs. R. Macpherson-Lawrie, for **Frederick Charles.** (See Class 72.)

Class 76.—*Hunter Mares or Geldings, born in or before* 1932, *up to more than* 13·7 *and not more than* 15 *stones.*

487 I. £20 & Champion.[1]—B. A. Selby, The Garden Cottage, The Goffs, Eastbourne, for **Mortimer,** brown gelding, born in 1928.
495 II. £15.—John Edward Jones, Treworgan, Llangrove, Hereford, for **China Cock,** bay gelding, born in 1930; *s.* Irrawaddy, *d.* Cardona *by* Cardonald.
468 III. £10.—J. V. Rank, Ouborough, Godstone, Surrey, for **Royal Flush,** bay brown gelding, born in 1930.
478 IV. £5.—Leslie Weaver, Carden, Malpas, for **Duty Paid,** brown, born in 1930.
494 V. £3.—W. Devereux, for **Gold Dust.** (See Class 73.)
439 R.N.—J. R. Hindley, for **Benedict.** (See Class 73.)

Class 77.—*Hunter Mares or Geldings, born in or before* 1932, *up to more than* 15 *stones.*

488 I. £20 & R.N. for Champion.[1]—B. A. Selby, The Garden Cottage, The Goffs Eastbourne, for **Marlborough,** dark bay gelding, born in 1928.
499 II. £15.—Miss E. Mary Pitt, Cressing House, Cressing, Braintree, for **Mount Royal** (Supp. No. 1939), grey gelding, born in 1929.
443 III. £10.—J. R. Hindley, Moorlands, Blacko, Nelson, Lancs., for **Golden Rain,** chestnut gelding, born in 1928.
496 IV. £5.—Miss Busfeild, Raysfield Farm, Chipping Sodbury, for **Streamline,** brown gelding, born in 1931.
447 V. £3.—Geoff Kenyon, Armscote, Stratford-on-Avon, for **James Pisa,** brown gelding, born in 1927.
452 R.N.—Hugh Sumner, Rashwood Court, Droitwich, for **Hunters Haven.**

WEIGHT-CARRYING COBS.

Class 78.—*Mares or Geldings, not exceeding* 15 *hands.*

509 I. £15.—Lt.-Col. Sir Archibald Weigall, K.C.M.G., Englemere, Ascot, for **Jorrocks,** chestnut gelding, born in 1930.
500 II. £10.—A. Brake, Higher Farm, Limington, Yeovil, for **Hope,** brown gelding, born in 1928.

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[1] Perpetual Silver-Gilt Challenge Cup given by ladies and gentlemen interested in Hunters for the best Hunter Mare or Gelding.

501 III. £5.—Misses Calmady-Hamlyn & Dawson, Pearroc Vean, Buckfast, Devon, for **Honey**, cream mare, born in 1930.

507 IV. £3.—Miss Joan Lindley Cave Penney, Rogue's Roost, Poundsgate, Newton Abbot, for **Bree**, bay mare, born in 1930.

504 R.N.—The Hon. Mrs. Violet Mundy, The Farm, Thornbury, Bristol, for **Spotted Dick.**

H.C.—508. C.—502, 505.

Hacks.

Class 79.—*Hack Mares or Geldings, over* 14·2 *and not exceeding* 15·1 *hands.*

513 **I. £15 & R.N. for Champion.**[1]—Major R. M. Stewart Richardson, Idover House, Dauntsey, Chippenham, for **Matze**, bay mare, born in 1931.

510 II. £10.—Mrs. Gulland, 26, Southwick Street, London, W., for **Nipper**, bay gelding, born in 1930.

506 III. £5.—Percy Palmer, Berrow Lodge, Clarence Park, Weston-super-Mare, for **Lady Jane**, grey mare, born in 1929.

515 IV. £3.—Violet Wellesley, Ford House, Churchinford, Chard, for **Popcorn**, chestnut mare, born in 1930.

511 R.N.—Capt. J. E. Hance, The Equitation School, Malvern, for **Neoti.**

Class 80.—*Hack Mares or Geldings, over* 15·1 *and not exceeding* 15·3 *hands.*

514 **I. £15 & Champion.**[1]—Major R. M. Stewart Richardson, Idover House, Dauntsey, Chippenham, for **Cotton Tail**, chestnut gelding, born in 1929.

517 II. £10.—Miss D. H. Ramsden, Bentleys, Allanson Road, Rhos-on-Sea, for **Seachest**, bay mare, bred by T. C. Armitage, Dene Court, Taunton; *s.* Seabath, *d.* 3139 Jest *by* Hon. Jummy 1109.

516 III. £5.—Miss Margaret McAlpine, Holmesdale, Nutfield, Surrey, for **Cherry Brandy**, bay gelding, born in 1927.

521 IV. £3.—Miss G. M. Yule, Hanstead House, Bricket Wood, St. Albans, for **Mother Superior**, bay mare, born in 1929.

512 R.N.—Capt. J. E. Hance, The Equitation School, Malvern, for **Creditors Please Note.**

Children's Ponies.

Class 81.—*Pony Mares or Geldings, not exceeding* 13 *hands, to be ridden by child born in or after* 1926.

531 I. £10.—A. Massarella & Sons, Ltd., Belmont, Bentley, Doncaster, for **Steel Dust**, grey gelding.

524 II. £5.—W. S. Codrington, Merlin Haven, Wotton-under-Edge, for **The Nut**, bay gelding, born in 1929.

529 III. £3.—Miss Judy Frank, Saddlewood Manor, Wotton-under-Edge, for **Gem**, grey mare, born in 1930.

528 R.N.—Patrick Fetherston-Godley, Stinchcombe Hill, Dursley, Glos., for **Smokey.**

H.C.—523, 532, 537. C.—533, 534.

Class 82.—*Pony Mares or Geldings, over* 13 *and not exceeding* 14 *hands, to be ridden by a child born in or after* 1923.

538 **I. £10 & R.N. for Champion.**[2]—William Benson, Harrowby Fields, Grantham, for **Flash**, chestnut mare, born in 1929.

541 II. £5.—The Hon. Noreen Stonor, Stonor Park, Oxfordshire, for **Royal Star**, chestnut gelding, born in 1929.

549 III. £3.—Mrs. Charles Stephens, Two Gates, Restronguet, Falmouth, for **Twinkle**, bay mare, born in 1928.

550 R.N.—Mrs. Young, Mill House, Gillingham, Dorset, for **Sheelagh.**

H.C.—543, 545. C.—548.

Class 83.—*Pony Mares or Geldings, over* 14 *and not exceeding* 15 *hands, to be ridden by a child born in or after* 1920.

513 **I. £10 & Champion**[2].—Major R. M. Stewart Richardson, for **Matze.** (See Class 79.)

553 II. £5.—The Hon. Noreen Stonor, Stonor Park, Oxfordshire, for **Cadogan Brunette**, dark brown mare, born in 1930.

551 III. £3.—William Benson, Harrowby Fields, Grantham, for **Taharina**, brown mare, born in 1932.

558 R.N.—Miss Vivien Lush, Little Court, Oxted, Surrey, for **Pearlstream.**

H.C.—555, 559. C.—560.

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[1] Silver Challenge Cup given by a member of the R.A.S.E. for the best Hack.

[2] Champion Silver Cup given by the Right Hon. the Lord Mayor of London for the best Pony in Classes 81 to 83.

Driving Classes.

SINGLE HARNESS.

Class 84.—*Stallions, Mares or Geldings (Novice), not exceeding* 14 *hands.*

572 I. £15.—MRS. EDGAR HENRIQUES, Fernholm, Hesketh Park, Southport, for 27030 **Fleetwood Petal,** bay mare, born in 1931; *s.* Fleetwood Storm 14676, *d.* 25841 Barmoor Lavender *by* Barmoor Shot 13153.

570 II. £10.—ELI GRIFFIN, 17-19, Church Street, Basingstoke, for **Basing Supreme,** brown gelding, born in 1930, bred by Enoch Glen, Bathgate; *s.* Milestone, *d.* Falinge Peggy *by* Southworth Swell.

564 III. £5.—WILLIAM BOLLEN, Riverside Farm, Shirehampton, Bristol, for **Glen Avon Pinnacle,** chestnut gelding, born about 1922.

Class 85.—*Stallions, Mares or Geldings (Novice), over* 14 *hands.*

584 I. £15.—JAMES AGATE, 22, Antrim Mansions, Belsize Park, London, N.W., for **Ego,** bay gelding, born in 1931, bred by the late E. D. Boston, Stud Farm, Wylde Green, Birmingham; *s.* Talke Bonfire 14178, *d.* 26635 Warwick Portia *by* Haydon's King Rufus 12860.

590 II. £10.—PAUL HOFFMANN, 4, Cardigan Mansions, Richmond Hill, Surrey, for **Orford Gavotte,** dark chestnut mare, born in 1926, bred by S. B. Carnley, Alford, Lincs.; *s.* Norbury Connaught 14167, *d.* 23697 Norbury Chansonette *by* Beckingham Victory 11345.

566 III. £5.—NIGEL C. COLMAN, M.P., 49, Grosvenor Square, London, W., for 26993 **Nork Sunlight,** bay mare, born in 1931; *s.* Mersey Searchlight 14238, *d.* 24073 Serene of York *by* Mathias 6473.

Class 86.—*Stallions, Mares or Geldings, not exceeding* 13·2 *hands.*

572 I. £15.—MRS. EDGAR HENRIQUES, for **Fleetwood Petal.** (See Class 84.)

567 II. £10.—NIGEL C. COLMAN, M.P., 49, Grosvenor Square, London, W., for **Nork Magnet** G.579, bay gelding, bred by the Dowager A. Drury de Perez, Huize de Beele, Voorst, Holland; *s.* Braishfield Fuse 13567, *d.* 25106 Habrough Ideal *by* Fusee 12626.

Class 87.—*Stallions, Mares or Geldings, over* 13·2 *and not exceeding* 14 *hands.*

592 I. £15.—PAUL HOFFMANN, 4, Cardigan Mansions, Richmond Hill, Surrey, for **Orford Caprice,** brown mare, born in 1926, bred by Mrs. A. C. King, Romsey, Hants.; *s.* Braishfield Royal Blue 14207, *d.* 19304 Little Lightheart *by* Little Ruby 9311.

581 II. £10.—FRANK C. MINOPRIO, Broadlands, Ascot, for **Mickey Mouse** G.737, bay gelding, bred by J. W. G. Smith, Aysgarth, Yorks.; *s.* Skeirbeck Wire Boy 14448, *d.* 24227 Glen Melbourne *by* Squire Melbourne 12167.

Class 88.—*Stallions, Mares or Geldings, over* 14 *and not exceeding* 15 *hands.*

575 I. £15.—MRS. EDGAR HENRIQUES, Fernholm, Hesketh Park, Southport, for 26770 **Fleetwood Nanette,** chestnut mare, born in 1925, bred by the late H. H. Parry, Springfield, Calne; *s.* Lavington Leader 13803, *d.* 23073 Defiant Princess *by* Polonius 4931.

584 II. £10.—JAMES AGATE, for **Ego.** (See Class 85.)

593 III. £5.—PAUL HOFFMANN, 4, Cardigan Mansions, Richmond Hill, Surrey, for **Modern Miss,** bay mare, born in 1927, bred by T. M. Stephenson, Huyton, Liverpool; *s.* Mersey Searchlight 14238, *d.* 19087 Flash Clara *by* Royal Danegelt 5785.

Class 89.—*Stallions, Mares or Geldings, over* 15 *hands.*

576 I. £15 & Champion.[1]—MRS. EDGAR HENRIQUES, Fernholm, Hesketh Park, Southport, for **Fleetwood Viking,** 14709, brown stallion, born in 1929, bred by Fletcher & Sons, The Grange, Angram, York; *s.* Buckley Courage 13771, *d.* 26410 Angram Brunette *by* Angram Majesty 11967.

583 II. £10 & R.N. for Champion.[1]—FRANK C. MINOPRIO, Broadlands, Ascot, for **Pollux** G.775, bay gelding, bred by Lord Ashtown, Woodlawn, Co. Galway; *s.* Woodlawn A.D.C. 14001, *d.* 25704 Woodlawn Merry May *by* Sir Augustus 6562.

568 III. £5.—NIGEL C. COLMAN, M.P., 49, Grosvenor Square, London, for 26523 **Modern Maid,** bay mare, bred by T. M. Stephenson, Junr., Ladycroft, Huyton, Liverpool; *s.* Mersey Searchlight 14238, *d.* 19087 Flash Clara *by* Royal Danegelt 5785.

574 R.N.—MRS. EDGAR HENRIQUES, for **Fleetwood Nightingale.**

Class 90.—*Special Class for Animals entered in Classes* 84 *to* 89 *that have not taken a First Prize at this Show.*

570 I.—£10.—ELI GRIFFIN, for **Basing Supreme.** (See Class 84.)

564 II. £5.—WILLIAM BOLLEN, for **Glen Avon Pinnacle.** (See Class 84.)

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[1] Champion Prize of £20 given for the best Animal in Classes 84 to 89. A Special Prize of £10 was given to the Reserve number.

DOUBLE HARNESS.

Class 91.—*Pairs of Stallions, Mares or Geldings.*

578 & 579 I. £15.—MRS. EDGAR HENRIQUES, Fernholm, Hesketh Park, Southport, for 26829 **Fleetwood Zephyr**, bay mare, born in 1928, bred by W. B. Lloyd, Rendova, Great Saughall, Chester; *s.* Vortex 14416, *d.* 26649 Rendova Vag *by* Axholme Knight 13554; and 26824 **Fleetwood Golden Rain**, bay mare, born in 1928, bred by A. Throup, Stud Farm, Wylde Green, Birmingham; *s.* Vortex 14416, *d.* 26432 Rougham Rubie *by* Peacock's Pride 12895.

580 & 581 II. £10.—FRANK C. MINOPRIO, for **King of the Lawn** G.893, bay gelding, born in 1929, bred by Mrs. E. Humphrey, The Grange, Morton, Gainsborough; *s.* Parkside Timothy 14437, *d.* 23855 Axholme Lady Edith *by* Southworth Swell; and **Mickey Mouse.** (See Class 87.)

590 & 594 III. £5.—PAUL HOFFMANN, for **Orford Gavotte** (see Class 85); and **Orford Victor**, dark chestnut gelding, bred by C. J. Long, Great Yarmouth; *s.* Thelveton Victor 13937, *d.* 26303 Breydon Betty *by* Fakenham Sir Charles 8842.

TANDEMS.

Class 92.—*Stallions, Mares or Geldings, not exceeding* 14 *hands.*

578 & 579 I. £15.—MRS. EDGAR HENRIQUES, for **Fleetwood Zephyr** and **Fleetwood Golden Rain.** (See Class 91.)

580 & 581 II. £10.—FRANK C. MINOPRIO, for **King of the Lawn** (see Class 91); and **Mickey Mouse** (see Class 87).

Class 93.—*Stallions, Mares or Geldings, over* 14 *hands.*

590 & 594 I. £15.—PAUL HOFFMANN, for **Orford Gavotte** (see Class 85); and **Orford Victor** (see Class 91).

CATTLE.

Unless otherwise stated the Prizes in each Class for Cattle are as follows: First Prize, £15; Second Prize, £10; Third Prize, £5; Fourth Prize, £4; Fifth Prize, £3.

Shorthorns.

Class 94.—*Shorthorn Bulls, born in or before* 1933.

703 I., Champion,[1] Champion[2] & Champion.[3]—A. J. MARSHALL, Bridgebank, Stranraer, for **Cruggleton Beverley** 256591, dark roan, born Aug. 28, 1932; *s.* Cruggleton Colonel 236411, *d.* 120952 Brenda Blythesome *by* Balcairn Celt 220695.

705 II.—JAMES PIPER, The Grange, Burntisland, Fife, for **Calrossie Rothes Baronet** 249385, red, born Sept. 29, 1931, bred by Capt. John MacGillivray, Calrossie, Nigg Station; *s.* Collynie Royal Leader 188656, *d.* 99275 Calrossie Mona Rothes *by* Benefactor 205067.

701 III.—SIR BERNARD GREENWELL, BART., Marden Park, Woldingham, Surrey, for **Marden Eagle** 252258, white, born Jan. 23, 1931; *s.* Walshford Field Marshal 234196, *d.* 80903 Godinton Orphan 8th *by* Balcairn Eagle 168680.

703, 722, 739 Special I.[4]—A. J. MARSHALL, for **Cruggleton Beverley, Cruggleton Borderer** and **Cruggleton Captivator.**

701, 708, 720 Special II.[4]—SIR BERNARD GREENWELL, BART., for **Marden Eagle, Marden Snowstorm** and **Marden Snowstorm 2nd.**

Class 95.—*Shorthorn Bulls, born on or between January* 1 *and March* 31, 1934.[5]

707 I.—WILLIAM GARNE, Aldsworth, Cheltenham, for **Harviestoun Courtier** 270908, roan, born Feb. 4, bred by J. E. Kerr, Harviestoun, Dollar; *s.* Harviestoun St. Colm 257810, *d.* 149830 Clipper Ceres *by* Harviestoun Salvadore 244622.

708 II.—SIR BERNARD GREENWELL, BART., Marden Park, Woldingham, Surrey, for **Marden Snowstorm** 271881, white, born Jan. 8; *s.* Marden Eagle 252258, *d.* Godinton Butterfly 12th 68879 *by* Balcairn Eagle 168680.

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[1] Champion Prize of £20 given by the Shorthorn Society for the best Bull. A Silver Medal was given by the Shorthorn Society to the Breeder of the Champion Bull.

[2] Silver Challenge Cup given by the Argentine Shorthorn Breeders' Association for the best Bull, bred by Exhibitor.

[3] The "Brothers Colling" Memorial Perpetual Challenge Cup presented through the Durham Agricultural Committee for the best Shorthorn.

[4] Special Prizes of £15 First Prize and £10 Second Prize given by the Shorthorn Society for the best groups of three Shorthorns bred by Exhibitor.

[5] Prizes given by the Shorthorn Society.

Class 96.—*Shorthorn Bulls, born on or between April* 1 *and December* 31, 1934.

713 I.—J. V. Rank, Delaware, Edenbridge, for **Bapton Banner Bearer** 268265, red roan, born May 11, bred by the Bapton Shorthorn Co., Bapton Manor, Codford, Wilts.; *s.* Bapton Ringleader 255310, *d.* 145441 Bapton Kilblean Beauty 13th *by* Calrossie Ringleader 235690.

709 II.—Miss A. S. Brocklebank, O.B.E., Wing Grange, Oakham, for **Aldsworth Marcus** 267930, roan, born June 10, bred by W. Garne, Aldsworth, Cheltenham; *s.* Glastullich Ronald 257527, *d.* 128550 Aldsworth Maria 3rd *by* Aldsworth Nimrod 195573.

715 III.—Lady N. J. Wills, Coombe Lodge, Blagdon, Bristol, for **Rickford Climax** 272864, white, born April 19; *s.* Rickford White Star 259737, *d.* 144835 Rickford Clipper 12th *by* Calrossie Butterfly Monarch 228718.

712 R.N.—Viscount Portman, Staple Fitzpaine Manor, Taunton, for **Stonelands Aviator.**

Class 97.—*Shorthorn Bulls, born on or between January* 1 *and March* 31, 1935.[1]

722 I.—A. J. Marshall, Bridgebank, Stranraer, for **Cruggleton Borderer,** red and little white, born Jan. 5; *s.* Cruggleton Beverley 256591, *d.* 144226 Balcairn Beauty's Pearl *by* Viscount Robin 227141.

726 II.—Duncan M. Stewart, Millhills, Crieff, for **Collynie Era,** white, born Jan. 2, bred by J. Duthie Webster, Collynie, Aberdeenshire; *s.* Rosehaugh Mandarin 233158, *d.* 124457 Collynie Eliza 10th *by* Baron Nonsuch 196111.

716 III.—J. Baird & Co. (Falkirk), Ltd., Bantaskin, Falkirk, for **Magheramorne Cæsar,** dark red, born March 4, bred by Major H. C. Robinson, Magheramorne, Antrim; *s.* Cruggleton Rock 256703, *d.* 163627 Anticur Dolly 2nd *by* Eclipse 222873.

723 R.N.—A. J. Marshall, for **Cruggleton Guide.**

Class 98.—*Shorthorn Bulls, born on or between April* 1 *and June,* 30, 1935.

739 I., R.N. for Champion,[2] R.N. for Champion[3] & R.N. for Champion.[4]—A. J. Marshall, Bridgebank, Stranraer, for **Cruggleton Captivator,** red and little white, born April 5; *s.* Cruggleton Essander 250076, *d.* 88516 Evana Clara *by* Collynie Royal Leader 188656.

741 II.—J. V. Rank, Delaware, Edenbridge, for **Bapton Royal Banner,** red, born April 24; *s.* Bapton Royal Robin 255311, *d.* 145441 Bapton Kilblean Beauty 13th *by* Calrossie Ringleader 235690.

729 III.—J. Baird & Co. (Falkirk), Ltd., Bantaskin, Falkirk, for **Balmuchy Masterstroke,** red, born April 25, bred by the Trustees of the late A. P. Gordon, Bindal, Portmahomack; *s.* Calrossie Sanctuary 228740, *d.* 111085 Naemoor Buttercup 4th *by* Pitpointie Herald 218177.

742 IV.—W. McNair Snadden, The Coldoch, Blair Drummond, Stirling, for **Coldoch Ronald,** red, born April 18; *s.* Collynie Magnet 262800, *d.* 162726 Coldoch Rothes Fairy *by* Collynie Red Eagle 214703.

740 R.N.—J. V. Rank, for **Bapton Leader Royal.**
H.C.—734, 744. C.—728, 738.

Class 99.—*Shorthorn Bulls, born on or between July* 1 *and December* 31, 1935.[5]

745 I.—J. Baird & Co. (Falkirk), Ltd., Bantaskin, Falkirk, for **Bantaskin Golden Sentinel,** roan, born Sept. 11; *s.* Crieffvechter Desperado 249960, *d.* 146379 Corston Bellona 19th *by* Balnakyle Sentinel 228036.

749 II.—W. McNair Snadden, The Coldoch, Blair Drummond, Stirling, for **Coldoch Sensation,** red, born Sept. 1; *s.* Bapton Crocus Leader 261766, *d.* 160049 Aldie Rosemary *by* Calrossie Satisfaction 249387.

747 III.—G. M. Hope, Basildon Home Farm, Pangbourne, for **Bestlesdune Boy,** dark roan, born Sept. 24; *s.* Pendley Speculation 259225, *d.* 141993 Lady Rosemary 25th *by* Doune Quartz 222690.

746 R.N.—Mrs. W. R. Calvert, Wetmore, Onibury, Shropshire, for **Wetmore Phoenix.**

Class 100.—*Shorthorn Cows, in-milk, born in or before* 1932.

751 I.—J. V. Rank, Delaware, Edenbridge, for **145439 Bapton Crocus 24th,** dark roan, born Nov. 23, 1932, calved March 9, 1936, bred by the Bapton Shorthorn Co., Bapton Manor, Codford, Wilts.; *s.* Calrossie Ringleader 235690, *d.* 125565 Bapton Crocus 16th *by* Collynie Viceroy 188660.

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[1] Prizes given by the Shorthorn Society.

[2] Champion Prize of £20 given by the Shorthorn Society for the Best Bull. A Silver Medal was given by the Shorthorn Society to the Breeder of the Champion Bull.

[3] Silver Challenge Cup given by the Argentine Shorthorn Breeders' Association for the best Bull bred by Exhibitor.

[4] The "Brothers Colling" Memorial Perpetual Challenge Cup presented through the Durham Agricultural Committee for the best Shorthorn.

[5] Special Prize of £15 First Prize and £10 Second Prize given by the Shorthorn Society or the best group of three Shorthorn bred by Exhibitor.

752 II.—W. McNair Snadden, The Coldoch, Blair Drummond, Stirling, for 130764 **Calrossie Roan Flora**, roan, born Jan. 27, 1930, calved March 31, 1936, bred by Capt. John McGillivray, Calrossie, Nigg Station; *s.* Naemoor Gaffer 192364, *d.* 27018 Calrossie Twin Flora *by* Sentinel Star 159279.

750 III.—G. M. Hope, Basildon Home Farm, Pangbourne, for 135352 **Yedingham Mina 12th**, dark roan, born April 1, 1931, calved Feb. 13, 1936, bred by F. Allison, Lilac Farm, Yedingham, Yorks.; *s.* Yedingham Warrior 241301, *d.* 70106 Yedingham Mina 3rd *by* Equinox 189562.

Class 101.—*Shorthorn Heifers, in-milk, born in* 1933.

754 I.—Miss A. S. Brocklebank, O.B.E., Wing Grange, Oakham, for 155786 **Wing Princess Royal 4th**, dark roan, born Oct. 9, calved Feb. 5, *1936*; *s.* Collynie Red Leader 249856, *d.* 83040 Wing Princess Royal *by* Balcairn Golden Monarch 186905.

757 II.—Duncan M. Stewart, Millhills, Crieff, for 157426 **Uppermill Paula**, roan, born Feb. 27, calved March 1, 1936, bred by James Durno, Uppermill, Tarves; *s.* Glastullich Watchman 237380, *d.* 44932 Climsland Paula *by* Cluny Nonpareil Choice 170400.

756 III.—W. McNair Snadden, The Coldoch, Blair Drummond, Stirling, for 160049 **Aldie Rosemary**, red, born April 2, calved Sept. 1, 1935, bred by F. McGillivray, Aldie, Tain; *s.* Calrossie Satisfaction 249387, *d.* 120596 Aldie Red Rose *by* Naemoor Jasper 217761.

755 R.N.—Dr. C. Breckon Robinson, Sherwood, Barnard Castle, for **Princess Victoria**.

Class 102.—*Shorthorn Heifers, born in* 1934.

760 **I. & Champion.**[1]—J. V. Rank, Delaware, Edenbridge, for 164839 **Bapton Augusta 11th**, roan, born Jan. 4, bred by the Bapton Shorthorn Co., Bapton Manor, Codford, Wilts.; *s.* Calrossie Ringleader 235690, *d.* 125562 Bapton Augusta 6th *by* Bapton Merry Lad 220862.

758 II.—Miss A. S. Brocklebank, O.B.E., Wing Grange, Oakham, for 165438 **Wing Broadhooks 3rd**, dark roan, born Oct. 5; *s.* Collynie Red Leader 249856, *d.* 146089 Wing Broadhooks 2nd *by* Wing Royal Sportsman 248056.

762 III.—Dr. C. Breckon Robinson, Sherwood, Barnard Castle, for 171825 **Golden Princess**, roan, born May 14; *s.* Royal Glory 259910, *d.* 122647 Golden Emblem *by* Gainford Barrister 215719.

Class 103.—*Shorthorn Heifers, born on or between January* 1 *and March* 31, 1935.

769 I.—W. McNair Snadden, The Coldoch, Blair Drummond, Stirling, for **Sheila**, dark roan, born March 24, bred by James Durno, Uppermill, Tarves, Aberdeenshire; *s.* Royal Star 266492, *d.* 127960 Secret Sunray *by* Naemoor Kudos 225154.

770 II.—Duncan M. Stewart, Millhills, Crieff, for **Fair Clipper 12th**, white, born March 10; *s.* Collynie Mandate 262801, *d.* 143461 Fair Clipper 7th *by* Elmley Golden Rain 230028.

768 III.—J. V. Rank, Delaware, Edenbridge, for **Bapton Princess Royal 15th**, dark roan, born March 9, 1935; *s.* Bapton Royal Robin 255311, *d.* 131184 Princess Constance *by* Bridgebank Rosedene 213883.

771 IV.—Lady N. J. Wills, Coombe Lodge, Blagdon, Bristol, for **Rickford Orange Blossom 7th**, roan, born March 6; *s.* Dacre Magic 256754, *d.* 124885 Rickford Orange Blossom 3rd *by* Cudham Prospect 206506.

766 R.N.—Sir Bernard Greenwell, Bart., Marden Park, Woldingham, Surrey, for **Marden Kilblean Beauty**,
H.C.—767.

Class 104.—*Shorthorn Heifers, born on or between April* 1 *and December* 31, 1935.

780 **I. & R.N. for Champion.**[1]—Duncan M. Stewart, Millhills, Crieff, for **Millhills Rothes Queen 17th**, red, born April 16; *s.* Collynie Mandate 262801, *d.* 123493 Millhills Rothes Queen 14th *by* Naemoor Ironclad 209846.

776 II.—James Piper, The Grange, Burntisland, Fife, *for* **Letham Rothes Queen 2nd**, red, born April 24; *s.* Letham Founder 245372, *d.* 124266 Balcairn Queen *by* Balcairn Royal Chieftain 213126.

778 III.—J. V. Rank, Delaware, Edenbridge, for **Bapton Eliza 7th**, red, born May 2; *s.* Bapton Crocus Leader 261766, *d.* 155107 Bapton Eliza 5th *by* Larbert Baron 220866.

779 IV.—Dr. C. Breckon Robinson, Sherwood, Barnard Castle, for **Augusta**, red, born July 6; *s.* Towiebarclay President 260701, *d.* 97626 Startforth Augusta 4th *by* Garguston Defiance 207532.

774 R.N.—Sir Bernard Greenwell, Bart., Marden Park, Woldingham, Surrey, for **Marden Eliza 2nd.**
H.C.—772. C.—777.

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[1] Champion Prize of £20 given by the Shorthorn Society for the best Cow or Heifer. A Silver Medal was given by the Shorthorn Society to the Breeder of the Champion Cow or Heifer.

Herefords.

Class 105.—*Hereford Bulls, born on or before August* 31, 1933.

786 **I. & Champion.**[1]—Richard O. Rees, Phocle, Ross-on-Wye, for **Mansel Limelight** 53498, born Sept. 9, 1930, bred by Capt. R. T. Hinckes, Mansel Lacy, Hereford; *s.* Orion of Pitsford 45197, *d.* Mansel Lewton 2nd 59318 *by* Eyton Horace 34935.

782 **II.**—Percy E. Bradstock, Free Town, Tarrington, Herefordshire, for **Penmaes Enterprise** 56334, born Jan. 7, 1933, bred by J. Pryce & Sons, Penmaes, Talgarth, Brecon; *s.* Glenside 48192, *d.* Constance *by* Leen Maylot 37179.

783 **III.**—Frank Cooke, Brook House, King's Pyon, Hereford, for **Llyssun Springer** 57480, born Dec. 27, 1932, bred by Mrs. H. Davies, Llyssun, Llamerfyl, Welshpool; *s.* Pivot of Pitsford 45259, *d.* Dinam Spring *by* Conjuror 44698.

784 **R.N.**—Arthur Henry Marfell, Upper Wall End, Monkland, Leominster, for **Vern Keystone.**

Class 106.—*Hereford Bulls, born on or between September* 1, 1933, *and August* 31, 1934.

787 **I. & R.N. for Champion.**[1]—His Majesty the King, The Royal Farms, Windsor, for **The Sultan,** born Nov. 3, 1933, bred by C. D. Jones, Abergwenddwr, Erwood, Brecon; *s.* Golden Warrior 51845, *d.* Songstress (Vol. 60, p. 360) *by* The Colonel 49846.

789 **II.**—Henry C. Dent, Eastwood, Tarrington, Herefordshire, for **Hillend Opalute,** born May 25, 1934, bred by C. L. Godson, Hillend, Hereford; *s.* Gobion Resolute 2nd 48210, *d.* Rose Opal (Vol. 58, p. 233) *by* Resolute 35537.

792 **III.**—John Parr, Burton, Ross-on-Wye, for **Burton Gladiator** 58362, born Dec. 1, 1933; *s.* Burton Lux 52961, *d.* Silk 2nd (Vol. 56, p. 473) *by* Bounds Ironclad 36089.

793 **R.N.**—David G. Watkins, Summerhill, Hay, Hereford, for **Vern Limelight.**
H.C.—791. **C.**—790.

Class 107.—*Hereford Bulls, born on or between September* 1 *and November* 30, 1934.[2]

794 **I., R.N. for Champion**[3] **& R.N. for Champion.**[4]—T. L. D. Everall, Shrawardine, Shropshire, for **Shradenlute** 59282, born Sept. 25; *s.* Shrine Fearless 55186, *d.* Shrine Lydia *by* Pertonlute 50945.

801 **II.**—Thomas L. Walker, The Cedars, Broadwas-on-Teme, Worcester, for **Ankerdine Conqueror,** born Sept. 20; *s.* Ankerdine Admiral 55456, *d.* Ankerdine Talkative (Vol. 62, p. 634) *by* Pershore Bunting 49625.

802 **III.**—Thomas L. Walker, for **Ankerdine Jubilee,** born Sept. 11; *s.* Ankerdine Admiral 55456, *d.* Ankerdine Graceful (Vol. 62, p. 630) *by* Resolute's Heir 51069.

799 **R.N.**—R. S. de Q. Quincey, The Vern, Bodenham, Hereford, for **Tarrington Glory.**
H.C.—798. **C.**—795.

Class 108.—*Hereford Bulls, born on or between December* 1, 1934, *and February* 28, 1935.

805 **I., Champion**[3] **& Champion.**[4]—H. R. Griffiths & Son, Little Tarrington, Herefordshire, for **Tarrington Idol** 59379, born Jan. 1, 1935, bred by H. R. Griffiths; *s.* Tarrington Sun God 56560, *d.* Ishbel *by* Tarrington Optimist 49837.

812 **II.**—E. Craig Tanner, Eyton-on-Severn, Wroxeter, for **Dinam King** 58533, born Jan. 26, 1935, bred by Dinam Estates Co., Llandinam; *s.* Gobion Resolute 2nd 48210, *d.* Gobion Oyster Queen 2nd (Vol. 61, p. 306) *by* Lancer of Pitsford 39420.

814 **III.**—Edward Webb & Sons (Stourbridge), Ltd., Astwood Farm, Stoke Works, Bromsgrove, for **Wickton Paddy** 59518, born Jan. 20, 1935, bred by F. J. Newman, Lower Wickton, Leominster; *s.* Crossways Emeralute 44726, *d.* Pink Pansy *by* Patchwork 34099.

804 **IV.**—Lord Cawley, Berrington Hall, Leominster, for **Berrington Nero** 58267, born Jan. 17, 1935; *s.* Pershore Gala 53861, *d.* Necklace *by* Stone Oysterman 46512.

803 **R.N.**—Percy E. Bradstock, Free Town, Tarrington, Herefordshire, for **Free Town Egmont.**

Class 109.—*Hereford Bulls, born on or after March* 1, 1935.

815 **I.**—Percy E. Bradstock, Free Town, Tarrington, Herefordshire, for **Free Town Editor** 58620, born May 10, 1935; *s.* Penmaes Enterprise 56334, *d.* Free Town Gossip 3rd *by* Eyton Taurus 49201.

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[1] Champion Prize of £10 10*s.* given by the Hereford Herd Book Society for the best Senior Bull.

[2] Prizes given by the Hereford Herd Book Society.

[3] Champion Prize of £10 10*s.* given by the Hereford Herd Book Society for the best Junior Bull.

[4] Perpetual Silver Challenge Trophy given through the Hereford Herd Book Society for the best Bull.

823 II.—E. G. Shew & Son, Cold Green, Bosbury, Ledbury, for **Shelderton Hopeful** 59270, born April 7, 1935, bred by G. Makelin & Sons, Shelderton, Clungunford, Craven Arms; *s.* Gobion Prince 49295, *d.* Doris Russell *by* Lawtonbury Beau 45044.

816 III.—H. R. Griffiths & Son, Little Tarrington, Herefordshire, for **Yazor Hopeful**, born April 11, 1935, bred by J. W. Jones, Byford House, Bridge Sollars, Hereford; *s.* Wormington Sunshine 55418, *d.* Violet (Vol. 65, p. 358) *by* Tarrington Major 46540.

817 R.N.—W. E. Lock, The Town, Castle Frome, Ledbury, for **Town Newton.**

Class 110.—*Hereford Cows or Heifers, in-milk, born on or before August* 31, 1933.

826 I. & R.N. for Champion.[1]—H. R. Griffiths & Son, Little Tarrington, Herefordshire, for **Morania** (Vol. 64, p. 293), born Sept. 22, 1932, calved Dec. 25, 1935, bred by H. R. Griffiths; *s.* Tarrington Sports Model 53924, *d.* Madrigal *by* Noke Ensign 45189.

828 II.—W. E. Lock, The Town, Castle Frome, Ledbury, for **Begonia 6th** (Vol. 60, p. 398), born Dec. 21, 1928, calved Jan. 14, 1936; *s.* Democrat of Pitsford 38987, *d.* Begonia 3rd *by* Bushman 38742.

829 III.—John Parr, Burton, Ross-on-Wye, for **Myrtle** (Vol. 63, p. 454), born Jan. 19, 1932, calved Oct. 7, 1935; *s.* Burton Lux 52961, *d.* More Silky *by* Rudhall Ironclad 39969.

827 R.N.—W. J. Jenkins & Sons, Marden Court, Hereford, for **Charlton Pin 3rd.**

Class 111.—*Hereford Heifers, born on or between September* 1, 1933, *and August* 31, 1934.

834 I.—F. J. Newman, Wickton Court, Stoke Prior, Leominster, for **Patch 5th** (Vol. 65, p. 447), born May 7, 1934; *s.* Crossways Emeralute 44726, *d.* Patch 4th *by* Patchwork 34099.

831 II.—Capt. E. H. Rouse Boughton, Downton Hall, Ludlow, for **Downton Hall Pearl** (Vol. 65, p. 191), born Jan. 25, 1934; *s.* Saracen 52427, *d.* Bertha *by* Crossways Nantilute 44729.

835 III.—Edward Webb & Sons (Stourbridge), Ltd., Astwood Farm, Stoke Works, Bromsgrove, for **Astwood Carrie 3rd** (Vol. 65, p. 611), born Nov. 1, 1933; *s.* Free Town Counsellor 50495, *d.* Nant Fawr Carmen *by* Lancer of Pitsford 39426.

833 R.N.—F. J. Newman, for **Gipsy 20th.**

Class 112.—*Hereford Heifers, born on or between September* 1 *and November* 30, 1934.[2]

841 I. & Champion.[1]—Richard O. Rees, Phocle, Ross-on-Wye, for **Phocle Marina**, born Nov. 2; *s.* Royal Salute 55145, *d.* Red Rose (Vol. 63, p. 511) *by* Pershore Duke 44064.

842 II.—Richard O. Rees, for **Phocle Rosina**, born Nov. 28; *s.* Royal Salute 55145, *d.* Primrose (Vol. 54, p. 537) *by* Kars 37046.

838 III.—Morgan T. Jones, Sugwas, Swainshill, Hereford, for **Sugwas Corisande 2nd**, born Sept. 15; *s.* Pershore Patrick 49642, *d.* Sugwas Corisande (Vol. 63, p. 355) *by* Rockett 42889.

839 R.N.—James Medlicott, Bodenham Court, Hereford, for **Countess.**

Class 113.—*Hereford Heifers, born on or after December* 1, 1934.

847 I.—Morgan T. Jones, Sugwas, Swainshill, Hereford, for **Sugwas Pearl 3rd**, born Jan. 29, 1935; *s.* Eyton Brutus 54507, *d.* Gobion Oyster Girl 4th (Vol. 59, p. 196) *by* Lancer of Pitsford 39426.

846 II.—A. H. Harrington, Mill End, Castle Frome, Ledbury, for **Kathleen**, born March 12, 1935; *s.* Astwood Pitcher 52783, *d.* Haughton Stella 2nd (Vol. 58, p. 207) *by* Wickton Cheerful 46625.

848 III.—William T. Morris, Lower Yatton Farm, Kingsland, Herefordshire, for **Duchess 12th**, born Dec. 14, 1934; *s.* Bounds Vine 52915, *d.* Duchess 10th (Vol. 64, p. 424) *by* Monkton Luna 47322.

850 R.N.—David G. Watkins, Summerhill, Hay, Hereford, for **Summerhill Spotlight.**

Devons.

Class 114.—*Devon Bulls, born in or before* 1933.

852 I.—George Brendon, Bude, Cornwall, for **Hawthorn Grand Duke** 14897, born Nov. 15, 1928, bred by R. Maunder, Hawthorn, Bathealton, Taunton; *s.* Coombeshead Grand Duke 13540, *d.* Lovely 4th 38322 *by* Alien 10831.

853 II.—Mark Britton & Sons, Rowridge, Tiverton, for **Rowridge Venture** 15032, born Nov. 11, 1929; *s.* Greenend Perfection 12276, *d.* Myrtle 37453 *by* Clinker 11390.

857 III.—W. J. King, Manor Farm, Cothelestone, Taunton, for **Cutsey Carados** 16060, born March 6, 1932, bred by Eland Clatworthy, Cutsey, Trull, Taunton; *s.* Blakes Trumpeter 14316, *d.* Cutsey Careless 43119 *by* Thatcher 11233.

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[1] Champion Prize of £10 10*s.* given by the Hereford Herd Book Society for the best Cow or Heifer.

[2] Prizes given by the Hereford Herd Book Society.

Class 115.—*Devon Bulls, born in* 1934.

858 **I. & Champion.**[1]—Abraham Trible & Sons, Halsdon, Holsworthy, Devon, for **Stoke Rubicon 17015**, born Feb. 1, bred by G. C. Alexander, Winterbourne Stoke ; *s.* Enmore Peg Top 15710, *d.* Stoke Rosa 39968 *by* Clampit Flier 12594.

859 **II. & R.N. for Champion.**[1]—Fred Yendell, Wood Barton, Morchard Bishop, Lapford, Devon, for **Howard Mill Hussar 16902**, born March 25, bred by G. & F. Heard, Howard Mill, Stratton ; *s.* Carey Darkie Boy 3rd 15195, *d.* Howard Mill Lassie 43337 *by* Lee Topper 14508.

Class 116.—*Devon Bulls, born in* 1935.

870 I.—Fred Yendell, Wood Barton, Morchard Bishop, Lapford, Devon, for **Morchard Dignity 17310**, born May 12 ; *s.* Clampit Go-Well 2nd 15649, *d.* Burne Caroline 43867 *by* Gutton Pretty Boy 13140.

868 II.—A. M. Williams, Werrington Park, Launceston, for **Werrington Monarch 17470**, born Feb. 14 ; *s.* Climsland Masterstroke 16403, *d.* Werrington Dainty 44805 *by* Werrington Royalist 14681.

860 III.—Fred Beadle, Stowey Farm, Timberscombe, Minehead, for **Stowey Factious 17407**, born March 15 ; *s.* Stowey Beau 15878, *d.* Stowey Fashion 45684 *by* Charton Tip Top 2nd 13515.

866 IV.—Abraham Trible & Sons, Halsdon, Holsworthy, Devon, for **Werrington Major 17467**, born June 13, bred by A. M. Williams, Werrington Park, Launceston ; *s.* Climsland Masterstroke 16403, *d.* Ham Mill Dainty 28th 43696 *by* Werrington Royalist 14681.

869 **R.N.**—P. M. Williams, Stowford, Chittlehampton, Devon, for **Stowford Charlie.**
H.C.—867.

Class 117.—*Devon Cows or Heifers, in-milk, born in or before* 1933.

871 I.—Cecil Brent, Clampit, Callington, Cornwall, for **Clampit Primrose 42988**, born Jan. 2, 1930, calved March 27, 1936 ; *s.* Peadhill Brightboy 13283, *d.* Collacott Princess C. 1039 *by* Pound Chief 10721.

872 II.—J. W. Bussell, Town Farm, Gittisham, Honiton, for **Town Myrtle 43rd 45764**, born May 15, 1933, calved Oct. 10, 1935 ; *s.* Wilscombe Dictator 15952, *d.* Town Myrtle 31st 40133 *by* Town Playful 12059.

874 III.—Abraham Trible & Sons, Halsdon, Holsworthy, Devon, for **Halsdon Alice 43793**, born Feb. 12, 1928, calved Nov. 7, 1935 ; *s.* Kingsford Duke 13207, *d.* Alice *by* Clampit Standard 10000.

873 **R.N.**—Eland Clatworthy, Cutsey, Trull, Taunton, for **Cutsey Blush.**

Class 118.—*Devon Heifers, born in* 1934.

881 **I. & Champion.**[2]—W. J. King, Manor Farm, Cothelestone, Taunton, for **Cherry 47590**, born Feb. 7, bred by Capt. H. Higson, Lufton, Yeovil ; *s.* Werrington Royalist 2nd 15941, *d.* Lufton Cherry 2nd 44341 *by* Avercombe Cracksman 13880.

882 **II. & R.N. for Champion.**[2]—Sir John Leigh, Bart., M.P., Witney Park, Godalming, for **Sandhill Beauty 7th**, born Sept. 12, bred by W. A. King, Sandhill, Washford, Somerset ; *s.* Daisy's Pride 15272, *d.* Sandhill Beauty 42452 *by* St. Audries Lordship 13339.

875 III.—His Majesty the King, The Royal Farms, Windsor, for **Windsor Molly 47144**, born March 25, bred by His Majesty King George V ; *s.* Warren's Park Timothy 16698, *d.* Warren's Park A.4 42991 *by* Stoke General 12877.

878 **R.N.**—J. W. Bussell, Town Farm, Gittisham, Honiton, for **Town Jenny 18th.**
H.C.—880.

Class 119.—*Devon Heifers, born in* 1935.

883 I.—His Majesty the King, Stoke Climsland, Cornwall, for **Climsland Fancy 47153**, born Feb. 12 ; *s.* Pigsdon Useful 14566, *d.* Climsland Gay Lassie 43929 *by* Coombeshead Monarch 14801.

885 II.—Cecil Brent, Clampit, Callington, Cornwall, for **Clampit Dainty 15th 4722**, born Jan. 18 ; *s.* Pigsdon Useful 14566, *d.* Clampit Dainty 10th 41040 *by* Pound Romper 12413.

884 III.—His Majesty the King, for **Climsland Ruby 2nd 47162**, born Jan. 28 ; *s.* Coombeshead Monarch 14801, *d.* Courtneys Rusty 3rd 45569 *by* Riddlecombe Hero 12841.

887 IV.—J. W. Bussell, Town Farm, Gittisham, Honiton, for **Town Jenny 20th 47266**, born March 5 ; *s.* Wilscombe Dictator 15952, *d.* Town Jenny 16th 47264 *by* Carey Dandy Boy 2nd 14749.

893 **R.N.**—A. M. Williams, Werrington Park, Launceston, for **Werrington Muriel.**
H.C.—892. **C.**—886.

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[1] Champion Prize of £10 10*s.* given by the Devon Cattle Breeders' Society for the best Bull.

[2] Champion Prize of £10 10*s.* given by the Devon Cattle Breeders' Society for the best Cow or Heifer

Class 120.—*Devon Dairy Bulls, any age, dam and sire's dam having been entered in the Dairy Section of the Herd Book.*

894 I.—H. G. Mayo, Dale's Corner, Piddlehinton, Dorchester, for **Corton Combine 17146**, born Aug. 16, 1934; *s.* Stratton Peter 13356, *d.* Corton Comet 43491 *by* Wynford Major 1st 12525.

895 II.—William Pyle, Harris Farm, Talaton, Exeter, for **Heazle Bungy 17247**, born Feb. 11, 1935, bred by G. E. Braddick, Heazle, Clayhidon, Cullompton; *s.* Brightley Bungy 15617, *d.* Heazle Primrose 2nd 45698 *by* Prince of Pound 14576.

Class 121.—*Devon Dairy Cows or Heifers, in-milk, entered in the Dairy Section of the Herd Book.*[1]

896 I.—G. E. Braddick, Heazle Barton, Clayhidon, Cullompton, for **Heazle Ida 6th C. 1297**, born June 24, 1927, calved May 30, 1936; *s.* First Venture 13125, *d.* Ida B. 891, *by* Pound Promise 9431.

897 II.—G. E. Braddick, for **Longlands Nancy 41820**, born April 13, 1928, calved April 7, 1936, bred by Thomas Triggol, Longlands, Bishop's Lydeard; *s.* Wilscombe Benefactor 13844, *d.* Wilscombe Dorothy 36891 *by* Farringdon Don 11460.

Sussex.

Class 122.—*Sussex Bulls, born in or before* 1934.

899 **I., Champion,[2] Champion[3] & Champion.[4]**—Henry B. Brandt, Capenor. Nutfield, Surrey, for **Petworth Loyal 5th 7978**, born Jan. 22, 1934, bred by Lord Leconfield, Petworth House, Petworth; *s.* Dillions Loyal 7555, *d.* Petworth Millmaid 5th 26204 *by* Lock Toreador 2nd 5924.

Class 123.—*Sussex Bulls, born in* 1935.

904 **I., R.N. for Champion,[2] R.N. for Champion[3] & R.N. for Champion.[4]**—Col. J. R. Warren, O.B.E., M.C., The Hyde, Handcross, Haywards Heath, for **Petworth Loyal 11th 8086**, born Jan. 12, bred by Lord Leconfield, Petworth House, Petworth; *s.* Dillions Loyal 7555, *d.* Oakover Comely 31st 22268 *by* Oakover Chevalier 10th 5815.

900 II.—Brig.-Gen. G. Holdsworth, C.B., C.M.G., Glynde Place, Glynde, Sussex, for **Caburn Dorin 8060**, born March 31; *s.* Caburn Diploma 6370, *d.* Crithall Careless 9th 26212 *by* Petworth Toreador 22nd 7024.

901 III.—Edward Hurtley, Crowborough Warren, Sussex, for **Crowborough Warren Rover 16th 8070**, born April 17; *s.* Crowborough Warren Rover 8th 6998, *d.* Lock Crystal 2nd 21915 *by* Jacobite 5116.

Class 124.—*Sussex Cows or Heifers, in-milk, born in or before* 1933.

905 **I. & Champion.[5]**—Brig.-Gen. G. Holdsworth, C.B., C.M.G., Glynde Place, Glynde, Sussex, for **Caburn Beauty 20th 26965**, born Jan. 16, 1933, calved Feb. 23, 1936; *s.* Caburn Diploma 6370, *d.* Caburn Gladeye 20747 *by* Wadden Luck 4891.

907 II.—Col. J. R. Warren, O.B.E., M.C., The Hyde, Handcross, Haywards Heath, for **Handcross Beauty 1st 27128**, born Jan. 28, 1933, calved March 29, 1936; *s.* Handcross Harlequin 7303, *d.* Wickham Court Beauty 114th 25272 *by* Ripton Rover 4554.

906 III.—Edward Hurtley, Crowborough Warren, Sussex, for **Crowborough Warren Finch 8th 26597**, born May 18, 1932, calved Feb. 10, 1936; *s.* Dillions Honest 7050, *d.* Crowborough Warren Finch 1st 24063 *by* Oakover Lad 18th 5819.

Class 125.—*Sussex Heifers, born in* 1934.

909 I.—Col. J. R. Warren, O.B.E., M.C., The Hyde, Handcross, Haywards Heath, for **Handcross Knelle 3rd 27483**, born May 17; *s.* Dillions Loyal 7555, *d.* Lock Knelle 2nd 23244 *by* Bolebroke Harlequin 3rd 6247.

908 II.—Brig.-Gen. G. Holdsworth, C.B., C.M.G., Glynde Place, Glynde, Sussex, for **Caburn Darkey 21st 27317**, born Feb. 2; *s.* Caburn Diploma 6370, *d.* Caburn Darkey 2nd 22721 *by* Hermitage King 5629.

Class 126.—*Sussex Heifers, born in* 1935.

914 I.—Col. J. R. Warren, O.B.E., M.C., The Hyde, Handcross, Haywards Heath, for **Handcross Knelle 4th**, born May 19; *s.* Jacques Court G.1 6707, *d.* Lock Knelle 2nd 23244 *by* Bolebroke Harlequin 3rd 6247.

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[1] Prizes given by the Devon Cattle Breeders' Society

[2] Champion Silver Medal given by the Sussex Herd Book Society for the best Bull.

[3] Perpetual Silver Challenge Trophy given through the Sussex Herd Book Society for the best Bull.

[4] Perpetual Silver Challenge Cup given by the Sussex Cattle Breeders' Society of South Africa for the best Sussex.

[5] Champion Silver Medal given by the Sussex Herd Book Society for the best Cow or Heifer.

910 II.—Brig.-Gen. G. Holdsworth, C.B., C.M.G., Glynde Place, Glynde, Sussex, for **Caburn Darkey 24th**, born March 31 ; *s.* Dillions Landlord 7553, *d.* Caburn Darkey 7th 25220 *by* Caburn Diploma 6370.

912 III.—Edward Hurtley, Crowborough Warren, Sussex, for **Crowborough Warren Princess 6th**, born March 30 ; *s.* Crowborough Warren Rover 8th 6998, *d.* Crowborough Warren Princess 1st 25692 *by* Otham Pilgrim 6521.

911 R.N.—Brig.-Gen. G. Holdsworth, C.B., C.M.G., for **Caburn Gentle 19th.**

Welsh.

Classes 127 to 131.—*Cancelled under Regulation* 10.

Park.

Classes 132 to 134.—*Cancelled under Regulation* 10.

Gloucestershires.

Class 135.—*Gloucestershire Bulls, any age.*

916 I.—The Duke of Beaufort, Badminton, Glos., for **Ciceter Primer 540**, born Aug. 10, 1931, bred by Earl Bathurst, Cirencester Park ; *s.* Ciceter Primate 488, *d.* Ogbourne Mar 358 *by* Badminton Bentley's Darling 41.

919 II.—Lt.-Col. H. C. Elwes, D.S.O., M.V.O., Colesborne, Cheltenham, for **Colesborne Primate 516**, born Jan. 1, 1930 ; *s.* Badminton Senator 445, *d.* Colesborne Primavera 2nd 480 *by* Colesborne Patron 228.

921 III.—Ladies S. & V. Hicks-Beach, Coln St. Aldwyn, Fairford, Glos., for **Misterton Colour Scheme 615**, born Sept. 3, 1934, bred by Lord Cromwell, Misterton Hall, Rugby ; *s.* Coln Sergeant 560, *d.* Misterton Brindle 1st 453 *by* Dodington Pinckney 3rd 304.

915 R.N.—Earl Bathurst, Cirencester Park, Glos., for **Ciceter Taurus.**
H.C.—918.

Class 136.—*Gloucestershire Cows or Heifers, in-milk, born in or before* 1933.

925 I.—Major Sir Frederick Cripps, Ampney Park, Cirencester, for **Ampney Freda 524**, born Aug. 27, 1930, calved Oct. 17, 1935 ; *s.* Misterton Pinckney 2nd 454, *d.* Ampney Margaret 1st 459 *by* Ciceter Goodluck 386.

922 II.—Earl Bathurst, Cirencester Park, Glos., for **Ciceter Hydrangea 579**, born Feb. 6, 1933, calved Oct. 21, 1935 ; *s.* Ciceter Queen's Champion 477, *d.* Ciceter Hyacinth 383 *by* Badminton Chancellor 372.

924 III.—The Duke of Beaufort, Badminton, Glos., for **Badminton Diadem 2nd 526**, born Feb. 16, 1930, calved March 12, 1936 ; *s.* Badminton Admiral 463, *d.* Badminton Diadem 434 *by* Colesborne Banker 364.

Class 137.—*Gloucestershire Heifers, born in or after* 1934.

927 I.—Earl Bathurst, Cirencester Park, Glos., for **Ciceter Mannequin 598**, born Feb. 8, 1934 ; *s.* Ciceter Black Prince 539, *d.* Ciceter Fashion *by* Ciceter Magnate.

926 II.—Earl Bathurst, for **Ciceter Dusky Queen 593**, born Feb. 25, 1934 ; *s.* Ciceter Black Prince 539, *d.* Ciceter Empress 490 *by* Badminton Emperor 443.

931 III.—Ladies S. & V. Hicks-Beach, Coln St. Aldwyn, Fairford, Glos., for **Coln Trinket C.1**, born March 12, 1934 ; *s.* Colesborne Primer 542, *d.* Coln Topsy 2nd B.7 *by* Ciceter Corporal 396.

930 R.N.—Lt.-Col. H. C. Elwes, D.S.O., M.V.O., Colesborne, Cheltenham, for **Colesborne Priestess.**

Longhorns.

Class 138.—*Longhorn Bulls, born in or after* 1934.

934 I. & **Champion.**[1]—R. S. Walters, Norfolk Lodge, Sutton Coldfield, for **Sutton Victor 948**, red, brindle and white, born March 27, 1929 ; *s.* Arden Final 891, *d.* Lady Violet of Kent *by* Admiral 632.

932 II.—T. G. Arnold, Ashgrove, Warwick Road, Solihull, for **Finham Victor 972**, red, brindle and white, born May 16, 1933, bred by R. R. Hollick, Stivichall, Coventry ; *s.* Westwood Victor 966, *d.* Finham Princess 5th *by* Sutton Rufus 930.

933 III.—R. S. Walters, for **Sutton Spec 976**, red, brindle and white, born April 2, 1932 ; *s.* Sutton Victor 948, *d.* Friar Special *by* Friar Pop 902.

Class 139.—*Longhorn Bulls, born in* 1935.

938 I.—W. E. Swinnerton, Crickley Barrow House, Northleach, for **Crickley Showman 982**, red and white, born June 11 ; *s.* Crickley Duke 971, *d.* Crickley Chestnut (Vol. 17, p. 11) *by* Waddon Duke 950.

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[1] Perpetual Silver Challenge Cup given by the Longhorn Cattle Society for the best Junior Longhorn.

936 II.—F. J. MAYO, Friar Waddon, Upwey, Weymouth, for **Friar Signor**, red, brindle and white, born July 6; *s.* Sutton Ruler 947, *d.* Friar Senorita (Vol. 16, p. 10) *by* Canley Omega 895.
935 III.—T. G. ARNOLD, Ashgrove, Warwick Road, Solihull, for **Crickley Forest Lad 981**, red, brindle and white, born Feb. 1, bred by W. E. Swinnerton, Crickley Barrow, Northleach; *s.* Crickley Forester 952, *d.* Stivichall Rugby 7th *by* Waddon Duke 950.
937 R.N.—W. E. SWINNERTON, for **Crickley Aristocrat.**

Class 140.—*Longhorn Cows or Heifers, in-milk, born in or before* 1933.

941 **I. & R.N. for Champion.**[1]—W. E. SWINNERTON, Crickley Barrow House, Northleach, for **Crickley Chestnut** (Vol. 17, p. 11), red and white, born May 17, 1931, calved June 8, 1936; *s.* Waddon Duke 950, *d.* Chestnut of Chippinghurst *by* Park Royal 777.
940 II.—F. J. MAYO, Friar Waddon, Upwey, Weymouth, for **Friar Senorita** (Vol. 16, p. 10), red and white, born July 11, 1929, calved June 5, 1936; *s.* Canley Omega 895, *d.* Friar Sprig *by* Aston 725.
939 III.—R. R. HOLLICK, Stivichall Grange, Coventry, for **Finham Princess 5th**, brindle and white, born Aug. 14, 1929, calved May 7, 1936; *s.* Sutton Rufus 930, *d.* Finham Princess 2nd (Vol. 14, p. 10) *by* Stivichall Cure 2nd 880.
942 R.N.—W. E. SWINNERTON, for **Crickley Ruby.**

Class 141.—*Longhorn Heifers, born in* 1934 *or* 1935.

944 **I. & Champion.**[2]—FRED BILLING, Whoberley Hall, Coventry, for **Coventrie Rousham 2nd** (Vol. 19, p. 6), plum, brindle and white, born May 7, 1934; *s.* Westwood Victor 966, *d.* Coventrie Rousham *by* Rousham Frolic 907.
948 **II. & R.N. for Champion.**[1]—W. E. SWINNERTON, Crickley Barrow House, Northleach, for **Crickley Hazel** (Vol. 19, p. 10), red, brindle and white, born Jan. 4, 1934; *s.* Crickley Forester 952, *d.* Crickley Chestnut *by* Waddon Duke 950.
949 III.—R. S. WALTERS, Norfolk Lodge, Sutton Coldfield, for **Sutton Special** (Vol. 19, p. 12), red, brindle and white, born May 13, 1934; *s.* Sutton Victor 948, *d.* Friar Special *by* Friar Pop 902.
947 R.N.—F. J. MAYO, Friar Waddon, Upwey, Weymouth, for **Waddon Countess.**
H.C.—946.

Aberdeen-Angus.

Class 142.—*Aberdeen-Angus Bulls, born on or before November* 30, 1933.

956 **I., Champion,**[3] **Champion,**[4] **R.N. for Champion**[5] **& R.N. for Champion.**[6]—SIR PRINCE PRINCE-SMITH, BART., Southburn, Driffield, for **Ecliptic of Southburn 80236**, born Feb. 8, 1932; *s.* Primary of Dunira 62646, *d.* Eclat of Southburn 85325 *by* Rufus of Buckland 53693.
950 II.—VISCOUNT ALLENDALE, Bywell, Stocksfield-on-Tyne, for **Jellaba Eric 84640**, born Feb. 21, 1933, bred by J. E. Kerr, Harviestoun, Dollar; *s.* Equipment of the Laws 77121, *d.* Jewel Erica 87333 *by* Guardian of Candacraig 61908.
955 III.—THE EYNSHAM ESTATE CO., Eynsham Hall, Witney, Oxon, for **Epic of Castlecraig 77099**, born March 20, 1931, bred by P. D. Robertson, Castlecraig, Ross-shire; *s.* Eclotus of Candacraig 70120, *d.* Erminever 4th of Castlecraig 91559 *by* Jupiter of Castlecraig 55161.
951 R.N.—H. B. BRANDT, Capenor, Nutfield, Surrey, for **Black Eric of Ettington.**
H.C.—954.

Class 143.—*Aberdeen-Angus Bulls, born on or between December* 1, 1933, *and November* 30, 1934.

961 I.—SIR PRINCE PRINCE-SMITH, BART., Southburn, Driffield, for **Gruach 87961**, born Dec. 30, 1933, bred by Sir Edmund Findlay, Bart., Aberlour; *s.* Prince Pride of Duthill 57900, *d.* Genus 86769 *by* Everome 61700.
963 II.—WALTER A. SANDEMAN, Morden House, Guilden Morden, Royston, for **Euston of Morden 87484**, born Feb. 17, 1934; *s.* Jupiter of Belvoir 71187, *d.* Cottesbrooke Elegance 92692 *by* Black Magician 60853.

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[1] Perpetual Silver Challenge Cup given by the Longhorn Cattle Society for the best Junior Longhorn.

[2] Perpetual Silver Challenge Cup given by the Longhorn Cattle Society for the best Senior Longhorn.

[3] Perpetual Silver Challenge Trophy given through the Aberdeen-Angus Cattle Society for the best Bull.

[4] Champion Gold Medal given by the Aberdeen-Angus Cattle Society for the best Aberdeen-Angus.

[5] Gold Medal given by the English Aberdeen-Angus Cattle Association for the best animal of the opposite sex to that of the animal awarded the Champion Gold Medal of the Aberdeen-Angus Cattle Society.

[6] Silver Medal given by the English Aberdeen-Angus Cattle Association for the best Aberdeen-Angus bred in England or Wales.

962 III.—Sir Prince Prince-Smith, Bart., for **Prodigal of Southburn** 89118, born Jan. 14, 1934; *s.* Envoy of Candacraig 52463, *d.* Pride of Bluefields 73580 *by* Black Knight of Auchterarder 45102.

959 R.N.—Baroness Burton, Rangemore Hall, Burton-on-Trent, for **Evasit of Harviestoun.**

Class 144.—*Aberdeen-Angus Bulls, born on or between December* 1, 1934, *and November* 30, 1935.

979 I., R.N. for Champion[1] & R.N. for Champion.[2]—Lady Robinson, Kirklington Hall, Newark, for **Jasper Eric of Derculich** 91845, born Dec. 30, 1934, bred by R. Wemyss Honeyman, Derculich, Strathtay; *s.* Pesco of Kinermony 81893, *d.* Jillina Erica 100142 *by* Eros of Derculich 70488.

969 II.—J. J. Cridlan, Maisemore Park, Gloucester, for **Prince Pike of Maisemore** 92790, born Dec. 17, 1934; *s.* Speyside Pike 68955, *d.* Pride of Maisemore 40th 92972 *by* Evideric 2nd of Maisemore 67432.

970 III.—The Earl of Elgin, K.T., C.M.G., Broomhall, Dunfermline, for **Ervum of Harviestoun** 91087, born Jan. 16, 1935, bred by J. E. Kerr, Harviestoun, Dollar; *s.* Equipment of The Laws 77121, *d.* Erora of Harviestoun 87327 *by* Enthraller of Lethen 54562.

976 IV.—Wm. Gilchrist Macbeth, Dunira, Comrie, Perthshire, for **Eurova of Dunira** 91181, born March 1, 1935; *s.* Erman of Dunira 70474, *d.* Eurosenne of Kinermony 89823 *by* Gratuitous 64618.

966 V.—Viscount Allendale, Bywell, Stocksfield-on-Tyne, for **Magic of Bywell** 92186, born April 17, 1935; *s.* Jellaba Eric 84640, *d.* Matuba of Bywell 85932 *by* Erebus of Harviestoun 56780.

975 R.N.—A. M. Holman, Hyes, Rudgwick, Sussex, for **Evolvit of Banks.**
H.C.—967.

Class 145.—*Aberdeen-Angus Cows or Heifers, in-milk, born on or before November* 30, 1933.

981 I.—Col. J. F. N. Baxendale, Froxfield Green, Petersfield, for **Mary of Bunchrew** 94076, born March 8, 1930, calved Feb. 6, 1936, bred by Capt. R. S. Fraser Mackenzie, Bunchrew, Inverness; *s.* Persistence 53327, *d.* May of Bunchrew 81589 *by* Erin of Skillymarno 52529.

984 II.—The Earl of Elgin, K.T., C.M.G., Broomhall, Dunfermline, for **Black Elsie of Broomhall** 96359, born March 16, 1931, calved Jan. 7, 1936; *s.* Excelsior of Bleaton 70705, *d.* Black Siller of Broomhall 90004 *by* Enthraller of Lochbank 61443.

987 III.—Leslie K. Osmond, Beelsby Hall, Grimsby, for **Black Meve of Beelsby** 97716, born May 24, 1931, calved Jan. 7, 1936; *s.* Electricity of Bywell 52341, *d.* Black Meva 82676 *by* Evon of Ballindalloch 45890.

982 R.N.—H. B. Brandt, Capenor, Nutfield, Surrey, for **Edia of Portlethen.**
H.C.—988. C.—989.

Class 146.—*Aberdeen-Angus Heifers, born on or between December* 1, 1933, *and November* 30, 1934.

1001 I., Champion[3] & Champion.[4]—Lady Robinson, Kirklington Hall, Newark, for **Iris of Kirklington** 107012, born Dec. 26, 1933; *s.* Prince Ben of Boghead 78685, *d.* Idyllina 2nd of Bladen 96215 *by* Borodin of Candacraig 63511.

995 II.—W. Lee, Hatchgate Farm, Wargrave-on-Thames, for **Mungos Peerless** 110195, born Feb. 20, 1934, bred by J. P. Ross-Taylor, Mungoswalls, Duns; *s.* Ermin of Mungoswalls 59133, *d.* Mungos Pola 101048 *by* Elf of Dunira 73508.,

999 III.—Sir Prince Prince-Smith, Bart., Southburn, Driffield, for **Elda of Southburn** 106873, born Jan. 15, 1934; *s.* Ernest of Harviestoun 80620, *d.* Elfreda of Southburn 91407 *by* Junius of Bywell 64891.

996 IV.—Wm. Gilchrist Macbeth, Dunira, Comrie, for **Bonnie Maid 2nd of Dunira** 106241, born March 1, 1934; *s.* Erman of Dunira 70474, *d.* Bonnie Maid of Dunira 84375 *by* Reminder of Ballindalloch 57999.

1000 R.N.—Sir Prince Prince-Smith, Bart., for **Emilita of Southburn.**
H.C.—1002. C.—991.

Class 147.—*Aberdeen-Angus Heifers, born on or between December* 1, 1934, *and November* 30, 1935.

1018 I.—Lady Robinson, Kirklington Hall, Newark, for **Everina 3rd of Ballintomb** 107703, born Jan. 10, 1935, bred by D. M. Allan, Ballintomb, Grantown-on-Spey; *s.* Permo of Kinamony 81882, *d.* Everina of Glamis 91850 *by* Prince Correa 55608.

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[1] Perpetual Silver Challenge Trophy given through the Aberdeen-Angus Cattle Society for the best Bull.

[2] Champion Gold Medal given by the Aberdeen-Angus Cattle Society for the best Aberdeen-Angus.

[3] Gold Medal given by the English Aberdeen-Angus Cattle Association for the best animal of the opposite sex to that of the animal awarded the Champion Gold Medal of the Aberdeen-Angus Cattle Society.

[4] Silver Medal given by the English Aberdeen-Angus Cattle Association for the best Aberdeen-Angus bred in England or Wales.

1013 **II.**—A. M. HOLMAN, Hyes, Rudgwick, Sussex, for **Miss Betty 3rd of Ballintomb** 107705, born Feb. 8, 1935, bred by D. M. Allan, Ballintomb, Grantown-on-Spey; *s.* Permo of Kinermony 81882, *d.* Miss Betty of Ballintomb 82960 *by* Elate of Ballindalloch 54421.

1003 **III.**—VISCOUNT ALLENDALE, Bywell, Stocksfield-on-Tyne, for **Jubilee of Bywell** 107734, born Jan. 15, 1935; *s.* Pelorus of Bywell 78476, *d.* Julie of Bywell 92444 *by* Elurio of Nisbethill 67008.

1019 **IV.**—LADY ROBINSON, Kirklington Hall, for **Ilex of Kirklington** 110144, born Dec. 25, 1934; *s.* Kirriemuir of Kirklington 84843, *d.* Idyllina 2nd of Bladen 96215 *by* Borodin of Candacraig 63511.

1022 **V.**—WYNDHAM T. VINT, Terry's Farm, Ormside, Appleby, Westmorland, for **Galahina** 108460, born Dec. 30, 1934, bred by D. P. Elliott, Nisbethill, Duns; *s.* Eros of Kinermony 59147, *d.* Gertie 2nd of Nisbethill 80915 *by* Prince of Pedigree 44448.

1020 **R.N.**—WYNDHAM T. VINT, for **Black Beet of Sandyknowe.**

H.C.—1007. **C.**—1015.

Cup.[1]—SIR PRINCE PRINCE-SMITH, BART.

R.N. for Cup.[1]—LADY ROBINSON.

Belted Galloways.

Class 148.—*Belted Galloway Bulls, born on or before November* 30, 1935.

1027 **I. & Champion.**[2]—THE NALC COMPANY, LTD., Gartmore, Stirling, for **Gartmore Peter** 1033 B., born Jan. 24, 1932, bred by Sir August Cayzer, Bart., Gartmore; *s.* Gartmore Nigel 839 B., *d.* Gartmore Soncie 3rd 1626 B. *by* Mark Hector 56 B.

1026 **II.**—THE NALC COMPANY, LTD., for **Gartmore Jim** 1109 B., born Jan. 13, 1935; *s.* Glenzier Watermark 725 B., *d.* Gartmore Dorothy 1st 826 B. *by* Mark Hector 56 B.

1024 **III.**—GEN. SIR IAN HAMILTON, 1, Hyde Park Gardens, London, W., for **Mark Andy** 1067 B., born March 23, 1933, bred by R. Graham, Auchengassel, Twynholm; *s.* Gartmore Herbert 477 B., *d.* Mark Polly 2nd 690 B. *by* Knockbrex Viking 50 B.

Class 149.—*Belted Galloway Cows or Heifers, in-milk, born on or before November* 30, 1933.

1031 **I.**—THE NALC COMPANY, LTD., Gartmore, Stirling, for **Gartmore Doreen 2nd** 2056 B., born March 16, 1930, calved Jan. 1, 1936, bred by Sir August Cayzer, Bart., Gartmore; *s.* Glenzier Watermark 725 B., *d.* Gartmore Doreen 1st 1312 B. *by* Mark Hector 56 B.

1030 **II.**—GEN. SIR IAN HAMILTON, 1, Hyde Park Gardens, London, W., for **Shenley Barbara** 1682 B., born Dec. 25, 1927, calved Oct. 10, 1935, bred by R. C. Irving, Shenley Lodge, Ridge Hill, Barnet; *s.* Mindork Lucky Boy 633 B., *d.* Knockbrex Bertha 610 B. *by* Knockbrex Prince Imperial 109 B.D.

1029 **III.**—GEN. SIR IAN HAMILTON, for **Gartmore Grace 3rd** 1032 B., born June 1, 1926, calved Sept. 6, 1935, bred by Sir August Cayzer, Bart., Gartmore, Stirling; *s.* Mark Hector 56 B., *d.* Gartmore Grace 315 B. *by* Gartmore Laidlaw 35 B.

1033 **R.N.**—THE NALC COMPANY, LTD., for **Gartmore Edith 1st.**

Class 150.—*Belted Galloway Heifers, born on or between December* 1, 1933, *and November* 30, 1934.

1036 **I. & R.N. for Champion.**[2]—THE NALC COMPANY, LTD., Gartmore, Stirling, for **Gartmore Helen 2nd** 3328 B., born March 7, 1934; *s.* Glenzier Watermark 725 B., *d.* Gartmore Helen 1st 1322 B. *by* Mark Hector 56 B.

1035 **II.**—THE NALC COMPANY, LTD., for **Gartmore Christian 4th** 3318 B., born Feb. 16, 1934; *s.* Glenzier Watermark 725 B., *d.* Gartmore Christian 1st 1842 B. *by* Gartmore Admiral 2nd 85 B.

1034 **III.**—GEN. SIR IAN HAMILTON, 1, Hyde Park Gardens, London, W., for **Lullenden Etty** 3418 B., born Jan. 12, 1934; *s.* Lullenden Concrete 983 B., *d.* Gartmore Grace 3rd 1032 B. *by* Mark Hector 56 B.

Class 151.—*Belted Galloway Heifers, born on or between December* 1, 1934, *and November* 30, 1935.[3]

1040 **I.**—THE NALC COMPANY, LTD., Gartmore, Stirling, for **Gartmore Winifred 6th** 3462 B., born Dec. 4, 1934; *s.* Glenzier Watermark 725 B., *d.* Gartmore Winifred 1st *by* Mark Hector 56 B.

1039 **II.**—THE NALC COMPANY, LTD., for **Gartmore Mary 8th** 3460 B., born Dec. 16, 1934; *s.* Glenzier Watermark 725 B., *d.* Gartmore Mary 2nd 1038 B. *by* Mark Hector 56 B.

1037 **III.**—GEN. SIR IAN HAMILTON, 1, Hyde Park Gardens, London, W., for **Lullenden Dainty** 3586 B., born Dec. 16, 1934; *s.* Lullenden Concrete 983 B., *d.* Lullenden Estelle 1st 2118 B. *by* Lullenden Falstaff 697 B.

1038 **R.N.**—GEN. SIR IAN HAMILTON, for **Lullenden Dolly 2nd.**

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[1] The "Mungoswalls" Silver Challenge Cup given through the English Aberdeen-Angus Cattle Association for the most points awarded in a combination of entries in Classes 142 to 147.

[2] The "Knockbrex" Perpetual Silver Challenge Cup given through the Dun and Belted Galloway Cattle Breeders' Association for the best Belted Galloway.

[3] Prizes given by the Dun and Belted Galloway Cattle Breeders' Association.

Galloway.

Classes 152 to 155.—*Cancelled under Regulation* 10.

Highland.

Classes 156 to 158.—*Cancelled under Regulation* 10.

Dairy Shorthorns.

Class 159.—*Dairy Shorthorn Bulls, born in or before* 1933.

1047 **I. & Champion.**[1]—Hobbs & Davis, Kelmscott, Lechlade, Glos., for **Kelmscott Premier 40th** 258167, roan, born April 1, 1932; *s.* Sorbrook Foggathorpe Premier 3rd 219269, *d.* 37830 Kelmscott Primula 183rd *by* Kelmscott Imperialist 36th 164408.

1048 **II. & R.N. for Champion.**[1]—Lord Loch, Street Farm, Stoke-by-Clare, Suffolk, for **Stokecollege Lord Leicester** 266971, roan, born Feb. 28, 1933; *s.* Stokecollege Secundus 253949, *d.* 131757 Leek Wild Duchess *by* Lord Leicester 83rd 231718.

1043 **III.**—Mr. and Mrs. T. R. C. Blofeld, Hoveton Home Farm, Wroxham, Norfolk, for **Streetly Lord York 4th** 260462, roan, born Aug. 11, 1932, bred by S. Owen Webb, Streetly Hall, West Wickham, Cambs.; *s.* Barleywood White Duke 228097, *d.* 92479 Streetly Lady York *by* Grand Champion 190168.

1054 **IV.**—Robert N. Tory, Anderson, Blandford, for **Anderson Imperial Minstrel 2nd** 234697, white, born May 2, 1929, bred by Debenham & Tory, Anderson, Blandford; *s.* Anderson Bates 15th 220511, *d.* 25049 Fulmer Melody *by* Leam Commissioner 149958.

1041 **R.N.**—Lt.-Col. R. W. Barclay, Bury Hill, Dorking, for **Buryhill Imperial Bates.**
H.C.—1046, 1049.

1047, 1199, 1200 **Bowl.**[2]—Hobbs & Davis, for **Kelmscott Premier 40th, Kelmscott Hilda 40th** and **Kelmscott Marjory 47th.**

1071, 1124, 1133 **R.N. for Bowl.**[2]—Major G. Miller Mundy, for **Redrice Wildeyes Imperator 2nd, Redrice Lady Winsonia** and **Knells Elliot Fernleaf 2nd.**

Class 160.—*Dairy Shorthorn Bulls, born in* 1934.

1059 **I.**—Miss R. M. Harrison, O.B.E., Maer Hall, Newcastle, Staffs., for **Townend Supreme** 273852, roan, born April 1, bred by J. Cowx, Town End, Uldale, Carlisle; *s.* Wreay Pilate 234517, *d.* 137279 Townend Pansy 12th *by* Best of All 235270.

1064 **II.** Simpson Williamson, Green House, Alveley, Bridgnorth, for **Alveley Count 22nd** 267957, roan, born June 5; *s.* Guards Brigade 230632, *d.* 124773 Alveley Lily 13th *by* Magic Wand 191838.

1058 **III.**—Chivers & Sons, Ltd., Histon, Cambridge, for **Crowood Windfall** 269539, roan, born March 23, bred by W. H. Holdcroft, Crowood Farm, Spondon, Derby; *s.* Grendon Windfall 230617, *d.* 115267 Baskerville Benson *by* Beaumont General 2nd 221009.

1062 **R.N.**—J. Pierpont Morgan, Wall Hall, Aldenham, Watford, for **Histon Gay Duke.**
H.C.—1057, 1060.

Class 161.—*Dairy Shorthorn Bulls, born on or between January* 1 *and March* 31, 1935.

1069 **I.**—E. J. Manners, The Old Hall, Netherseale, Burton-on-Trent, for **Aikbank Dairy Lord,** roan, born Jan. 9, bred by John Barnes, Aikbank, Wigton; *s.* Village Lord 260789, *d.* 122969 Cherryhill Ruby 6th *by* Haweswater Hero 216197.

1073 **II.**—J. A. Williams, Castle Hill, Pannal Ash, Harrogate, for **Moorpark Oxford King,** red, born Jan. 3; *s.* Brackenhurst Regal Darlington 255644, *d.* 92744 Oxford Lily *by* Moorpark Winker 201133.

1067 **III.**—Major R. F. Fuller, Great Chalfield, Melksham, Wilts., for **Chalfield Minstrel 2nd,** red, born Feb. 8; *s.* Anderson Imperial Minstrel 4th 241485, *d.* 128505 Chalfield Strawberry 5th *by* Preshute Salaam 5th 232710.

1070 **R.N.**—E. J. Manners, for **Netherseale Wildeyes Mascot.**
H.C.—1068, 1071, 1072.

Class 162.—*Dairy Shorthorn Bulls, born on or between April* 1 *and June* 30, 1935.[3]

1077 **I.**—J. Hewson & Sons, Parton, Wigton, for **Illington Clarence 3rd,** roan, born April 4, bred by E. McGregor, Manor Farm, Lillington, Leamington Spa; *s.* Shawell Clarence 253715, *d.* 106703 Duchess Telluria 7th *by* Harberwain Mascot 216124.

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[1] Champion Prize of £10 given by the Shorthorn Society for the best Bull.

[2] The "Brackenhurst" Silver Challenge Bowl given through the Shorthorn Society for the best group of one Bull and two Cows or Heifers.

[3] Prizes, except Fourth, given by the Shorthorn Society.

1080 II.—W. H. Holdcroft, Crowood Farm, Spondon, Derby, for **Crowood Wild Prince**, roan, born May 4; *s.* Diamond Star 256908, *d.* 125460 Baskerville Wild Eyes 2nd *by* Baskerville Lord John 220970.
1081 III.—A. Thomas Loyd, Lockinge House, Wantage, for **Lockinge Craftsman 4th**, white, born May 4; *s.* Lockinge Masterpiece 258529, *d.* 140552 Lockinge Princess Moira 2nd *by* King Barrington 231295.
1090 IV.—Capt. D. M. Wills, Barley Wood, Wrington, Somerset, for **Barleywood Incense**, roan, born April 12; *s.* Thornby Lord Foggathorpe 27th 254148, *d.* 154492 Barleywood Kirklevington Lass 4th *by* Barleywood Carol Singer 235094.

1074 R.N.—John Crowe, Ashe Manor, Overton, Hants., for **Double Duke**.
H.C.—1082, 1084, 1085, 1088.

Class 163.—*Dairy Shorthorn Bulls, born on or between July* 1 *and December* 31, 1935.

1100 I.—L. Hignett, Hook End Farm, Checkendon, Reading, for **Checkendon Imperial Waterloo**, red, born July 19; *s.* Double Imperial 206832, *d.* 46598 Ockley Waterloo 12th *by* Histon Wild Duke 172494.
1110 II.—The Duke of Westminster, G.C.V.O., D.S.O., Eaton Home Farm, Aldford, Chester, for **Eaton Hallmark**, roan, born July 4; *s.* Eaton Rose King 207056, *d.* 144513 Eaton Winsonia 5th *by* Eaton Ruby Prince 198323.
1111 III.—J. A. Williams, Castle Hill, Pannal Ash, Harrogate, for **Pannal Butler**, roan, born Aug. 5; *s.* Moorpark Winsome King 265367, *d.* 154320 Moorpark Butterfly *by* Greattew Clarence 2nd 223438.
1092 IV.—Capt. T. Allen-Stevens, Wicklesham Lodge, Faringdon, for **Wicklesham Duke 6th**, roan, born Aug. 27; *s.* Hoveton Oxford Bates 264411, *d.* 135338 Wicklesham Duchess 3rd *by* Wicklesham Barrington Duke 241135.
1113 V.—Capt. Cecil M. Wills, M.C., Sherfield Court, Basingstoke, for **Sherfield Darlington Duke**, roan, born Aug. 24; *s.* Grand Duke Oxford 8th 251094, *d.* 144821 Sherfield Double Darlington *by* Chalfield Lord Darlington 4th 228895.

1108 R.N.—W. H. Vigus, Revells Croft, Bengeo, Hertford, for **Revels Crown Prince**.
H.C.—1097, 1109, 1112, 1114.

Class 164.—*Dairy Shorthorn Cows, in-calf.*[1]

1124 I.—Major G. Miller Mundy, Red Rice, Andover, for **131617 Redrice Lady Winsonia**, light roan, born Sept. 21, 1930; *s.* Grendon Barrister 223477, *d.* 83123 Grendon Winalot 2nd *by* Grendon White Hope 163784.
1116 II.—Capt. T. Allen-Stevens, Wicklesham Lodge, Faringdon, for **135338 Wicklesham Duchess 3rd**, roan, born June 18, 1931; *s.* Wicklesham Barrington Duke 241135, *d.* 93402 Wicklesham Duchess *by* Thornby Governor 211996.
1127 III.—G. H. Willis, Birdlip, Glos., for **118000 Rose Grey 8th**, roan, born Jan. 28, 1929, bred by J. K. & R. M. Fenwick, Lesson Hall, Wigton; *s.* Prince Supreme 210534, *d.* Rose Grey 6th *by* Verdun 139902.

1126 R.N.—The Duke of Westminster, G.C.V.O., D.S.O., Eaton Home Farm, Aldford, Chester, for **Eaton Belle 14th**.
H.C.—1121. C.—1117, 1118, 1119.
1126, 1160, 1161 **Cup.**[2]—The Duke of Westminster, G.C.V.O., D.S.O., for **Eaton Belle 14th, Eaton Fragrance and Eaton Marjorie 3rd.**
1169, 1170, 1171 **R.N. for Cup.**[2]—E. Uwins Gillate, for **Cromarbry Grimstage, Cromarbry Daisy and Cromabry Rosemary 2nd.**

Class 165.—*Dairy Shorthorn Cows, in-milk, born in or before* 1929.[1]

1133 I.—Major G. Miller Mundy, Red Rice, Andover, for **118071 Knells Elliot Fernleaf 2nd**, roan, born March 16, 1929, calved April 29, 1936, bred by C. Fisher, Knells Farm, Carlisle; *s.* Favourite Blend 180751, *d.* 73396 Knells Elliot Fern *by* Walby Daisy King 194903.
1129 II.—Frederick Chapman, Moor Park Farm, Harrogate, for **124677 Heather Bell**, roan, born Oct. 7, 1929, calved June 19, 1936, bred by J. A. Williams, Pannal Ash, Harrogate; *s.* Telluria Marquis 211926, *d.* Heather Bee *by* Heather Prince 199417.
1134 III.—J. Timberlake, Hastoe Farm Tring, for **123872 Foggathorpe Primrose 9th**, red, born Feb. 13, 1929, calved June 11, 1936; *s.* Lord Aster 224627, *d.* 68482 Foggathorpe Primrose 6th *by* Proud Burgher 184087.

1130 R.N.—John Crowe, Ashe Manor, Overton, Hants., for **Duchess 178th.**
H.C.—1131. C.—1128, 1132, 1136.

Class 166.—*Dairy Shorthorn Cows, in-milk, born in* 1930.

1142 I.—J. Timberlake, Hastoe Farm, Tring, for **134012 Hastoe Millicent 2nd**, red and little white, born March 20, calved June 18, 1936; *s.* Double Imperial 206832, *d.* Millicent *by* Yeldersley Prince George 113741.

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[1] Prizes, except Fourth, given by the Shorthorn Society.

[2] Perpetual Silver Challenge Cup and a cash prize of £40 given through the Shorthorn Society for the best group of three Cows or Heifers by the same sire. The sire must be living in the British Isles, and have produced living progeny in 1936. A cash prize of £10 was awarded in respect of the Reserve Group and a small replica of the Cup was given, through the Shorthorn Society, to the owner of the sire winning the Cup.

1139 II.—St. Clere Estates, Ltd., St. Clere, Kemsing, Sevenoaks, for 129446 **Kelmscott Lovely 156th**, dark roan, born Sept. 2, calved April 16, 1936, bred by Hobbs & Davis, Kelmscott, Lechlade; *s.* Kelmscott Ringleader 41st 231196, *d.* 108742 Kelmscott Lovely 152nd *by* Sorbrook Foggathorpe Premier 3rd 219269.

1137 III.—Lt.-Col. R. W. Barclay, Bury Hill, Dorking, for 125841 **Wallthwaite Cherry Blossom 2nd**, roan, born Oct. 9, calved May 14, 1936, bred by Messrs. Bennett & Lambert, Troutbeck, Penrith; *s.* Pearl's Matchmaker 210183, *d.* 94030 Wallthwaite Cherry Blossom *by* Prince Cressy 184027.

Class 167.—*Dairy Shorthorn Cows, in-milk, born in* 1931.

1145 I. & R.N. for Champion.[1]—Chivers & Sons, Ltd., Histon, Cambridge, for 139426 **Elkstone Barrington Duchess**, white, born Nov. 23, calved May 6, 1936, bred by W. H. Hitch, Combend Farm, Elkstone, Cheltenham; *s.* Thornby Lord Foggathorpe 4th 203387, *d.* 114569 Portway Barrington Duchess *by* Thornby Charger 203378.

1146 II.—John Day, Stone House, East Pennard, Shepton Mallet, for 137588 **Huxham Duchess Rose 7th**, roan, born Dec. 15, calved May 20, 1936; *s.* Steeple Lord Lee 233725, *d.* 48579 Clipston Duchess Rose *by* Thornby Peeler 159911.

1163 III.—G. H. Willis, Birdlip, Glos., for 136433 **Millbeck Benedict's Lucy 2nd**, roan, born Feb. 16, calved May 22, 1936, bred by J. F. S. & A. Brownrigg, Millbeck Hall, Keswick; *s.* Millbeck Standard 217596, *d.* 94578 Millbeck Benedict's Lucy *by* Embleton Prince 207111.

1164 IV.—G. H. Willis, for 139577 **Thrimby Lady Elma**, roan, born March 23, calved May 18, 1936, bred by Henry Holme & Sons, Thrimby, Penrith; *s.* Thrimby Alfred 240737, *d.* 94281 Leeming Jane 6th *by* Field End Marksman 198601.

1156 V.—J. Pierpont Morgan, Wall Hall, Aldenham, Watford, for 141427 **Aldenham Foggathorpe 5th**, roan, born June 17, calved April 24, 1936; *s.* Aldenham Kirklevington Duke 2nd 204357, *d.* 106614 Loobagh Foggathorpe 23rd *by* Loobagh Ringer 7th 182683.

1152 R.N.—W. H. Holdcroft, Crowood Farm, Spondon, Derby, for **Lawnhead Moss Rose 45th**.

H.C.—1148, 1149, 1158, 1159, 1160. C.—1143, 1147, 1150, 1161.

Class 168.—*Dairy Shorthorn Cows or Heifers, in-milk, born in or after* 1932.

1181 I.—J. Pierpont Morgan, Wall Hall, Aldenham, Watford, for 151236 **Aldenham Barrington 9th**, red, born April 25, 1932, calved June 2, 1936; *s.* Loobagh Dreadnought 13th 224619, *d.* 121377 Aldenham Barrington 6th *by* Aldenham Barrington Duke 220429.

1165 II.—Lt.-Col. R. W. Barclay, Bury Hill, Dorking, for 151831 **Holmelacy Ringlet 30th**, dark roan, born Aug. 23, 1932, calved May 11, 1936, bred by T. W. Montague Perkins, Ufton Court, Holme Lacy; *s.* Lacy Publisher 208868, *d.* 78182 Holmelacy Ringlet 13th *by* Histon Wild Prince 2nd 172495.

1170 III.—E. Uwins Gillate, Shawlands, Lingfield, for 148436 **Cromarbry Daisy**, roan, born July 10, 1932, calved May 17, 1936; *s.* Streetly Lord Barrington 2nd 240567, *d.* 120468 Orford Daisy 17th *by* Orford Duke 3rd 224334.

1174 IV.—Sir William Hicking, Bart., Brackenhurst Hall, Southwell, for 149591 **Wreay Wild Eyes 27th**, roan, born Sept. 5, 1932, calved June 5, 1936, bred by W. Jackson & Sons, The Wreay, Wigton; *s.* Wreay Pilate 234517, *d.* 129851 Wreay Wild Eyes 10th *by* Wreay Conjuror 3rd 234512.

1187 V.—Capt. Arnold S. Wills, Thornby Hall, Northampton, for 154481 **Thornby Wild Queen**, roan, born April 6, 1932, calved May 25, 1936; *s.* Thornby Royalist Foggathorpe 2nd 219664, *d.* 71237 Cheston Wild Queen *by* Foggathorpe Premier 163306.

1188 R.N.—Capt. D. M. Wills, Barley Wood, Wrington, Somerset, for **Barleywood Priceless 3rd**.

H.C.—1166, 1169, 1182, 1185. C.—1171, 1172, 1173.

Class 169.—*Dairy Shorthorn Heifers, in-milk to first calving, born in or after* 1933.

1200 I. & Champion.[1]—Hobbs & Davis, Kelmscott, Lechlade, for 158819 **Kelmscott Marjory 47th**, roan, born March 30, 1933, calved April 23, 1936; *s.* Imperial Roderick 251569, *d.* 129449 Kelmscott Marjory 44th *by* Kelmscott Acrobat 44th 172874.

1217 II.—Capt. Arnold S. Wills, Thornby Hall, Northampton, for 164158 **Thornby Darling Duchess 7th**, roan, born March 13, 1933, calved May 10, 1936; *s.* Thornby Prettyman 2nd 247559, *d.* 114571 Portway Darling Duchess *by* Thornby Ringer 9th 219663.

1199 III.—Hobbs & Davis, for 158810 **Kelmscott Hilda 40th**, white, born May 31, 1933, calved May 31, 1936; *s.* Imperial Roderick 251569, *d.* 119273 Kelmscott Hilda 39th *by* Sorbrook Foggathorpe Premier 3rd 219269.

1189 IV.—Capt. T. Allen-Stevens, Wicklesham Lodge, Faringdon, for 154810 **Wicklesham Waterloo Molly 4th**, roan, born April 13, 1933, calved May 23, 1936; *s.* Wicklesham Lord Barrington 4th 247984, *d.* 84855 Lancefield Waterloo *by* Lancefield Baritone 200207.

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[1] Champion Prize of £10 given by the Shorthorn Society for the best Cow or Heifer.

1191 V.—LT.-COL. R. W. BARCLAY, Bury Hill, Dorking, for 155122 **Buryhill Lorna Doone**, red and little white, born Aug. 31, 1933, calved May 18, 1936; *s.* Copsale Wild Ruler 249900, *d.* 125494 Silverstream Lorna Doone 10th *by* Thornby Lord York 2nd 185645.

1190 R.N.—LT.-COL. R. W. BARCLAY, for **Buryhill Lady Ringlet 2nd.**

H.C.—1193, 1195, 1196.

1156, 1181, 1182 Bowl.[1]—J. PIERPONT MORGAN, for **Aldenham Foggathorpe 5th, Aldenham Barrington 9th** and **Aldenham Barrington Duchess 6th.**

1169, 1170, 1171 R.N. for Bowl.[1]—E. UWINS GILLATE, for **Cromarbry Brimstage, Cromarbry Daisy** and **Cromarbry Rosemary 2nd.**

Lincolnshire Red Shorthorns.

Class 170.—*Lincolnshire Red Shorthorn Bulls, born in or before* 1934.

1224 I. & Champion.[2]—E. S. TANSLEY, Willoughby Manor, Alford, Lincs., for **Seaholm Exchequer** 26129, born June 29, 1931; *s.* Anwick Exchequer 23424, *d.* Cockerington No. 148 *by* Petwood Normanby 19700.

1223 II. & R.N. for Champion.[2]—REINHOLD & FRESHNEY, Little Milton, Oxford, for **Anwick Instructor** 26361, born March 12, 1932, bred by C. L. Bembridge, Walcott, Lincoln; *s.* Wolferton Romeo 24236, *d.* Anwick No. 73 *by* Chetwode Kim 20167.

1220 III.—ALBONE BROS., Spridlington, Lincoln, for **Cockerington Bob 10th** 27769, born Jan. 10, 1934, bred by J. W. and B. S. Needham, South Cockerington, Louth; *s.* Anderby Bob 24281, *d.* Cockerington No. 80 *by* Beacon Hill Hussein 16086.

1225 R.N.—LEONARD WELLS, The Homestead, North Scarle, Lincoln, for **Chetwode Tinker.**

Class 171.—*Lincolnshire Red Shorthorn Bulls, born in* 1935.

1228 I.—JOE HALLAM, Holme, Newark, for **Holme James**, born May 24; *s.* Covenham Chequers 1st 26480, *d.* Holme Mary (Vol. 39, p. 233) *by* Strubby Francis 15th 26203.

1230 II.—E. S. TANSLEY, Willoughby Manor, Alford, Lincs., for **Seaholm Exchequer 4th**, born June 29; *s.* Seaholm Exchequer 26129, *d.* Beacon Hill Ava (Vol. 31, p. 432) *by* Cockerington Anderby 16282.

1226 III.—C. L. BEMBRIDGE, Walcott, Lincoln, for **Anwick Lister**, born June 19; *s.* Melton Triumph 25360, *d.* Anwick No. 202 (Vol. 38, p. 193) *by* Wolferton Romeo 24236.

1227 R.N.—H. GORE BROWNE, Broombriggs, Woodhouse Eaves, Loughborough, for **Broombriggs Cuckfield.**

Class 172.—*Lincolnshire Red Shorthorn Cows or Heifers, in-milk, born in or before* 1933.[3]

1232 I.—**John Evens & Son**, Burton, Lincoln, for **Burton Melton 8th** (Vol. 38, p. 236), born Jan. 18, 1931, calved June 26, 1936; *s.* Saltfleet Cupbearer 23984, *d.* Burton Melton 2nd *by* Stapleford Fox 14903.

1234 II.—E. S. TANSLEY, Willoughby Manor, Alford, Lincs., for **Seaham Dolly 2nd** (Vol. 40, p. 352), born May 8, 1933, calved March 15, 1936; *s.* Broombriggs Vulcan 25777, *d.* Tathwell Dolly *by* Anderby Tempter 17226.

1231 III.—H. GORE BROWNE, Broombriggs, Woodhouse Eaves, Loughborough, for **Broombriggs Veronica** (Vol. 38, p. 201), born June 5, 1931, calved Nov. 9, 1935; *s.* Saltfleet Waterloo 22442, *d.* Broombriggs Rachel *by* Swineshead Bill 20798.

1235 R.N.—RUSSELL WOOD, Bendish House, Hitchin, for **Bendish Sunbeam 12th.**

Class 173.—*Lincolnshire Red Shorthorn Cows, in-milk, born in or before* 1931, *showing the best milking properties.*

1237 I.—FRANK SAINSBURY, Blunts Hall, Little Wratting, Haverhill, for **Wratting Milker 2nd** (Vol. 38, p. 299), born July 31, 1931, calved June 7, 1936; *s.* Burton Rose Boy 8th 23526, *d.* Wratting Milker *by* Burton Rose Boy 7th 20140.

1240 II.—**Russell Wood**, Bendish House, Hitchin, for **Bendish Cherry 37th** (Vol. 37, p. 338), born Sept. 9, 1930, calved May 23, 1936; *s.* Ketteringham Milkman 19549, *d.* Bendish Cherry 24th *by* Langford Bendish 19564.

1238 III.—THE SCOTHERN DAIRY CO., Scothern Manor, Lincoln, for **Lobthorpe Princess** (Vol. 38, p. 271), born in Feb., 1929, calved May 10, 1936, bred by Col. C. de Paravicini, Birkholme Manor, Corby; *s.* Cockerington Anderby 16282, *d.* Beacon Hill Rahab *by* Tealby No. 318 14957.

1236 R.N.—JOHN EVENS & SON, Burton, Lincoln, for **Burton Ruby Spot 32nd.**

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[1] The "Nottingham" Silver Challenge Bowl given through the Shorthorn Society for the best group of three Cows or Heifers in-milk in Classes 165 to 169.

[2] Silver Challenge Cup given through the Lincolnshire Red Shorthorn Association for the best Bull.

[3] Prizes given by the Lincolnshire Red Shorthorn Association.

Class 174.—*Lincolnshire Red Shorthorn Cows or Heifers, in-milk, born in or after* 1932, *showing the best milking properties.*[2]

1241 **I. & R.N. for Champion.**[1]—John Evens & Son, Burton, Lincoln, for **Burton Red Rose 10th** (Vol. 39, p. 220), born Jan. 8, 1932, calved May 17, 1936 ; *s.* Burton Aim 13th 25075, *d.* Burton Red Rose 6th *by* Burton Conqueror 2nd 17360.
1244 **II.**—Russell Wood, Bendish House, Hitchin, for **Bendish Nancy 32nd** (Vol. 40, p. 363), born Oct. 2, 1933, calved May 8, 1936 ; *s.* Ketteringham Milkman 19549, *d.* Bendish Nancy 7th *by* Langford Bendish 19564.
1243 **III.**—Russell Wood, for **Bendish Gem 22nd** (Vol. 40, p. 362), born Aug. 9, 1933, calved May 3, 1936 ; *s.* Bargate Luck 25016, *d.* Bendish Gem 16th *by* Ketteringham Milkman 19549.

1242 **R.N.**—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Wratting Poppy.**

Class 175.—*Lincolnshire Red Shorthorn Heifers, born in* 1934.

1245 **I. & Champion.**[1]—S. Cecil Armitage, Lenton Fields, Nottingham, for **Lenton Violet** (Vol. 40, p. 192), born Jan. 21 ; *s.* Lenton Pawdy 26617, *d.* Cropwell Violet 9th *by* Cropwell Ajax 24454.
1246 **II.**—C. L. Bembridge, Walcott, Lincoln, for **Anwick No. 263** (Vol. 41, p. 199), born Sept. 9 ; *s.* Anwick Guarantee 26947, *d.* Anwick No. 89 *by* Chetwode Kim 20167.
1247 **III.**—H. Gore Browne, Broombriggs, Woodhouse Eaves, Loughborough, for **Broombriggs Betty,** born March 6 ; *s.* Leasingham Mascot 76th 26609, *d.* Broombriggs Vera (Vol. 38, p. 201) *by* Saltfleet Waterloo 22442.

1248 **R.N.**—H. Gore Browne, for **Broombriggs Biddy.**

Class 176.—*Lincolnshire Red Shorthorn Heifers, born in* 1935.

1253 **I.**—S. Cecil Armitage, Lenton Fields, Nottingham, for **Lenton Violet 3rd,** born Feb. 21 ; *s.* Saltfleet Waterloo 22442, *d.* Cropwell Violet 9th (Vol. 37, p. 320) *by* Cropwell Ajax 24454.
1256 **II.**—H. Gore Browne, Broombriggs, Woodhouse Eaves, Loughborough, for **Broombriggs Clara,** born March 17 ; *s.* Anderby Ford 26917, *d.* Broombriggs Wren (Vol. 39, p. 187) *by* Saltfleet Waterloo 22442.
1261 **III.**—E. S. Tansley, Willoughby Manor, Alford, Lincs., for **Seaholm Ruth 26th,** born May 14 ; *s.* Seaholm Exchequer 26129, *d.* Tathwell Goldfinch (Vol. 34, p. 223) *by* Anderby Tempter 17226.

1255 **R.N.**—H. Gore Browne, for **Broombriggs Charming.**
H.C.—1252.

South Devons.[2]

Class 177.—*South Devon Bulls, born in or before* 1934.

1266 **I. & Champion.**[3]—J. Wakeham, Rowden, Newton Ferrers, for **Pamflete New Fashion 12901,** born April 4, 1930, bred by F. J. Harvey, Pamflete, Holbeton ; *s.* Englebourne No. 15 12026, *d.* Acorns 9th 32409 *by* Hollowcombe Pamflete Nip 11131.
1263 **II.**—G. C. Maddever, Looe Down, Liskeard, for **Milkman 12288,** born Sept. 28, 1928, bred by A. N. Boon, Rock Park, Salcombe, Devon ; *s.* Widland Milkman 11949, *d.* Duchess 29638 *by* Golden Melody 9183.
1262 **III.**—John T. Dennis, Winsor, Yealmpton, for **Lawhyre Masher 5th 13528,** born Feb. 5, 1933, bred by Major Sir Charles E. B. Hanson, Bart., Fowey Hall, Cornwall ; *s.* Lawhyre Masher 1st 12528, *d.* Lawhyre Beauty 8th 32369 *by* Flete Prince 10235.

1265 **R.N.**—Miss Jervoise Smith, Sandwell, Totnes, for **Sandwell Colchicum.**

Class 178.—*South Devon Bulls, born in* 1935.

1267 **I. & R.N. for Champion.**[3]—Richard W. Chaffe, Worswell Barton, Newton Ferrers, for **Worswell Captain 14th 14000,** born Jan. 18 ; *s.* XL Captain 13184, *d.* Worswell Golden Primrose 8th 36041 *by* Flete Prince 10235.
1268 **II.**—J. H. Cumming, Keynedon, Sherford, Frogmore, Kingsbridge, for **Knowle Stanley 13916,** born April 4, bred by S. Wroth, Knowle, Aveton Gifford ; *s.* Trehele Lumpy 11920, *d.* Nosegay 15th 35163 *by* Battisborough Good Sort 11335.
1269 **III.**—J. Rossiter & Son, Cholwells, Kingsbridge, for **Cholwells Gladiator No. 19 13833,** born Feb. 21 ; *s.* Harestone Gladiator 12819, *d.* Cholwells Gloria 36553 *by* Gerston Peer 11473.

1270 **R.N.**—Miss Jervoise Smith, Sandwell, Totnes, for **Sandwell Negus.**

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[1] Silver Challenge Cup given through the Lincolnshire Red Shorthorn Association for the best Cow or Heifer.

[2] £20 towards these Prizes was given by the South Devon Herd Book Society.

[3] Silver Challenge Cup given by the South Devon Herd Book Society for the best Bull.

Class 179.—*South Devon Cows or Heifers, in-milk, born in or before* 1933.

1271 **I. & Champion.**[1]—J. Hendy, Alston, Holbeton, for **Alston Lassie 5th 36333**, born July 2, 1931, calved Jan. 8, 1936; *s.* Hall Torrs Finance 12495 *d.* Alston Lassie 26904 *by* Battisborough Cadet 6941.

1272 **II.**—John A. Irish, Edmeston, Modbury, for **Edmeston Pansy 36378**, born April 27, 1931, calved Jan. 21, 1936; *s.* Coombe Don 12441, *d.* Pansy 34044 *by* Court Perfection 10632.

1274 **III.**—George Wills, Rydon, Ogwell, Newton Abbot, for **Hawthorn 8th 35141**, born Sept. 12, 1929, calved Oct. 30, 1935; *s.* Wychbrook Champion 10995, *d.* Hawthorn 7th 32954 *by* Yeoman 11331.

Class 180.—*South Devon Heifers, born in* 1934.

1275 **I. & R.N. for Champion.**[1]—J. H. Cumming, Keynedon, Sherford, Frogmore, Kingsbridge, for **Keynedon Beauty 38104**, born Aug. 12; *s.* Berry Prince 12th 13003, *d.* Princess 35322 *by* Keaton Dairyman 11141.

1277 **II.**—J. Rossiter & Son, Cholwells, Kingsbridge, for **Cholwells Gaumont 38389**, born May 4; *s.* Harestone Gladiator 12819, *d.* Gertie 35768 *by* Gerston Peer 11473.

1276 **III.**—E. H. Luckes, Court Barton, South Pool, Kingsbridge, for **Court May 38272**, born Jan. 12; *s.* Coleridge No. 51 12431, *d.* Marie 32551 *by* Hernaford King 3rd 10282.

1278 **R.N.**—Miss Jervoise Smith, Sandwell, Totnes, for **Hallowell Primrose 4th.**

Class 181.—*South Devon Heifers, born in* 1935.

1286 **I.**—George Wills, Rydon, Ogwell, Newton Abbot, for **Rydon Primula 11th 38949**, born Jan. 15; *s.* Englebourne No. 10 11765, *d.* Rydon Primula 9th 37383 *by* Charleton No. 55 12416.

1281 **II.**—J. H. Cumming, Keynedon, Sherford, Frogmore, Kingsbridge, for **Lily of the Valley 38597**, born March 2; *s.* General 12239, *d.* Ruby 35323 *by* Keaton Dairyman 11141.

1283 **III.**—J. Rossiter & Son, Cholwells, Kingsbridge, for **Cholwells Daydream, 38872**, born May 27; *s.* Harestone Gladiator 12819, *d.* Cholwells Daisy 36545 *by* Gerston Peer 11473.

1282 **R.N.**—E. H. Luckes, Court Barton, South Pool, Kingsbridge, for **Court Crystal.**
H.C.—1285. **C.**—1284.

Red Polls.

Class 182.—*Red Poll Bulls, born in or before* 1933.

1295 **I. & R.N. for Champion.**[2]—Stuart Paul, Kirton Lodge, Ipswich, for **Brightwell Conqueror 16017**, born Jan. 23, 1931, bred by the Rt. Hon. E. G. Pretyman, Orwell Park, Ipswich; *s.* Seven Springs Luckstone 13923, *d.* 27506 Brightwell Constance *by* Shotley Drummer 11203.

1293 **II.**—Major A. B. Mitchell, Poulton Priory, Fairford, Glos., for **Seven Springs Quarry 16859**, born July 6, 1933, bred by Capt. Alan Richardson, Seven Springs, Cheltenham; *s.* Meddler Full Cry 13138, *d.* 30380 Seven Springs Quest *by* Harefield Clinker 11000.

1292 **III.**—Mrs. G. Meinertzhagen, Theberton House, Theberton, Suffolk, for **Morston Hero 16828**, born Feb. 15, 1933, bred by A. T. Pratt, Morston Hall, Trimley, Ipswich; *s.* Basildon Hero 14416, *d.* 32948 Morston Lucy 4th *by* Necton Conductor 10383.

1289 **IV.**—Mrs. R. M. Foot, White Hill, Berkhamsted, for **White Hill D'Ye Ken 16588**, born May 8, 1931; *s.* White Hill Cub Hunter 15166, *d.* 33536 Basildon Rosemary 2nd *by* Hanningfield Conductor 12646.

1287 **R.N.**—Lt.-Col. R. C. Batt, C.B.E., M.V.O., Gresham Hall, Norfolk, for **Lichfield Red Rover.**
H.C.—1290. **C.**—1291.

Class 183.—*Red Poll Bulls, born in* 1934.

1310 **I. & Champion.**[2]—Capt. C. S. Schreiber, Marlesford Hall, Woodbridge, for **Brightwell Prospect 17305**, born March 12, bred by G. M. T. Pretyman, Orwell Park, Ipswich; *s.* Basildon Count 15213, *d.* 37123 Brightwell Port *by* Kirton Foreman 13461.

1305 **II.**—Sir Guy Hambling, Bart., Rookery Park, Yoxford, Suffolk, for **Yoxford Royal 4th 17252**, born Jan. 28; *s.* Ashmoor Sapper 15989, *d.* 30347 Royal Mavis *by* Royal Sunshine 11452.

1303 **III.**—Capt. Sir H. E. de Trafford, Bart., Newsells Park, Barkway, Royston, for **Newsells Lynchman 17150**, born April 23; *s.* Manor Lynchman 16182, *d.* 44231 Sprowston Sesame 3rd *by* Norton Romney 14278.

1304 **IV.**—J. G. Gray, Coombe Abbey, Coventry, for **Abbeycombe Juniper 16927**, born Feb. 17; *s.* Abbeycombe Fabian 15561, *d.* 46500 Abbeycombe Gloria *by* Tittleshall Arravale 13952.

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[1] Silver Challenge Cup given by the South Devon Herd Book Society for the best Cow or Heifer.

[2] Champion Prize of £5 given by the Red Poll Cattle Society for the best Bull.

1308 V.—H. D. Longe, Abbot's Hall, Stowmarket, for **Combs Red Light** 16996, born Sept. 26; *s.* Tansor Quentin 16875, *d.* 35493 Combs Rosie 5th *by* Aspall Eros 5th 11535.

1297 R.N.—Lt.-Col. R. C. Batt, C.B.E., M.V.O., Gresham Hall, Norfolk, for **Gresham Magneto.**
H.C.—1301, 1309. C.—1299.

Class 184.—*Red Poll Bulls, born on or between January* 1 *and May* 31, 1935.

1319 I.—Sir Guy Hambling, Bart., Rookery Park, Yoxford, Suffolk, for **Yoxford Heath** 17593, born March 4; *s.* Ashmoor Sapper 15989, *d.* 41824 Manor White Heather *by* Kirton Sam 13462.

1321 II.—Lt.-Col. C. Heyworth-Savage, Bradwell Grove, Burford, Oxford, for **Bradwell Soarer** 17291, born Jan. 28; *s.* Upton Marquis 14707, *d.* 40925 Bradwell Sally *by* Bradwell Red Pepper 14040.

1320 III.—N. A. Heywood, Glevering Park, Wickham Market, Woodbridge, for **Glevering Hawk Owl** 17383, born May 7; *s.* Oulton Gauntlet 16234, *d.* 40981 Brightwell Purity *by* Seven Springs Luckstone 13923.

1317 IV.—J. G. Gray, Coombe Abbey, Coventry, for **Abbeycombe Kentime** 17257, born Feb. 2; *s.* Abbeycombe Royal Roseman 16315, *d.* 46496 Abbeycombe Gaytime *by* Basildon Baronet 14772.

1318 R.N.—J. G. Gray, for **Abbeycombe Knight.**
H.C.—1312, 1325. C.—1316.

Class 185.—*Red Poll Bulls, born on or between June* 1 *and December* 31, 1935.[1]

1338 I.—Capt. Alan Richardson, Southrop Manor, Lechlade, for **Seven Springs Cardinal** 17532, born Aug. 30; *s.* Meddler Full Cry 13138, *d.* 46736 Brightwell Charter 3rd *by* Basildon Count 15213.

1339 II.—Dolphin Smith, Mackrey End Farm, Harpenden, for **Harpenden Full Cry,** 17393, born June 2; *s.* Meddler Full Cry 13128, *d.* 42210 Seven Springs Quandary *by* Sudbourne Loyalist 11814.

1336 III.—Stuart Paul, Kirton Lodge, Ipswich, for **Kirton Victor** 17427, born June 1; *s.* Brightwell Conqueror 16017, *d.* 32945 Model Victoria *by* Combs Heroic 11912.

1332 IV.—Sir Guy Hambling, Bart., Rookery Park, Yoxford, Suffolk, for **Yoxford Stormer** 17596, born June 11; *s.* Chipstead Stormer 16989, *d.* 50612 Yoxford Beryl 4th *by* Abbeycombe Drake 14747.

1330 V.—C. H. Chearn, Gatwick Farm, Upper Gatton, Reigate, for **Chipstead Dickson,** born Aug. 16; *s.* Chipstead Dobin 16981, *d.* 40734 Ashmoor Briony *by* Ashmoor Dowser 14013.

1328 R.N.—Lt.-Col. Sir Merrik R. Burrell, Bart., C.B.E., Knepp Castle Estate Office, Horsham, for **Knepp Mammon.**
H.C.—1327, 1333. C.—1331.

Class 186.—*Red Poll Cows, in-milk, born in or before* 1930.

1345 **I. & Champion.**[2]—Lord Cranworth, Grundisburgh Hall, Woodbridge, for **43388 Grundisburgh Good Duck,** born July 22, 1929, calved May 1, 1936; *s.* Longford Drake 14229, *d.* 35746 Grundisburgh Good Luck *by* Framlingham Fanatic 12612.

1356 II.—Lady Loder, Leonardslee, Horsham, for **43518 Hyders Coral,** born Dec. 18, 1929, calved June 27, 1936, bred by Mrs. Dyer, Hyders, Crawley; *s.* Gresham Warrior 14142, *d.* 40371 Sporle Reflecting Coral *by* Necton Minister 13880.

1346 III.—Capt. Sir H. E. de Trafford, Bart., Newsells Park, Barkway, Royston, for **45666 Longwood Christabel 6th,** born Nov. 19, 1930, calved April 30, 1936, bred by C. & A. W. Kidner, Easton, Norwich; *s.* Mendham Emperor 15042, *d.* 39842 Longwood Christabel 2nd *by* Marham Daimio 12738.

1351 IV.—Mrs. M. L. Griffith, Little Hallingbury Park, Essex, for **45360 Hallingbury Ruby,** born March 10, 1930, calved April 1, 1936; *s.* White Hill Hunter 14719, *d.* 37525 Grundisburgh Ruby *by* Gresham Mainstay 13030.

1353 V.—Col. H. E. Hambro, C.B.E., Coldham Hall, Bury St. Edmunds, for **41937 Morston Girl 14th,** born Feb. 11, 1928, calved Oct. 1, 1935, bred by A. T. Pratt, Trimley, Ipswich; *s.* Brightwell Peerless Lad 13317, *d.* 23947 Morston Girl 3rd *by* Necton Conductor 12083.

1341 R.N.—Sir Woodman Burbidge, Bart., Cisswood, Lower Beeding, Horsham, for **Knepp Primula 3rd.**
H.C.—1358. C.—1350.

Class 187.—*Red Poll Cows or Heifers, in-milk, born in* 1931, 1932 *or* 1933.[1]

1373 **I. & R.N. for Champion.**[2]—N. A. Heywood, Glevering Park, Wickham Market, Woodbridge, for **47230 Glevering Siskin,** born Sept. 21, 1931, calved April 14, 1936; *s.* Bredfield Romulus 5th 14049, *d.* 39387 Glevering Redbreast *by* Hallingbury Crossbow 13767.

1362 II.—Lt.-Col. Sir Merrik R. Burrell, Bart., C.B.E., Knepp Castle Estate Office, Horsham, for **49665 Knepp Minerva 23rd,** born June 24, 1932, calved April 27, 1936; *s.* Seven Springs Quaestor 15121, *d.* 43646 Knepp Minerva 16th *by* Knepp Senator 13836.

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[1] Prizes, except Fourth and Fifth, given by the Red Poll Cattle Society.

[2] Champion Prize of £5 given by the Red Poll Cattle Society for the best Cow or Heifer.

1380 III.—Capt. Alan Richardson, Southrop Manor, Lechlade, for 48085 **Seven Springs Question**, born July 17, 1931, calved Sept. 14, 1935; *s.* Meddler Full Cry 13138, *d.* 30380 Seven Springs Quest *by* Harefield Clinker 11000.

1376 IV.—Lady Loder, Leonardslee, Horsham, for 49726 **Leonardslee Blackberry**, born Oct. 10, 1932, calved May 5, 1936; *s.* Knepp Strawberry 15775, *d.* 41917 Mickleover Brownie *by* Glevering Heron 13389.

1360 V.—Miss Mary H. Bouverie, Delapre Abbey, Northampton, for 50769 **Bergh Apton Winnie**, born June 17, 1933, calved June 7, 1936, bred by J. W. Westrup, Bergh Apton, Norwich; *s.* Longwood Star 7th 16178, *d.* 45593 Lanham's Wilga *by* Graunt Court Taurus 14136.

1372 R.N.—Col. H. E. Hambro, C.B.E., Coldham Hall, Bury St. Edmunds, for **Ashmoor Crumpet.**
H.C.—1369, 1379. C.—1366, 1371.

Class 188.—*Red Poll Heifers, born in* 1934.

1387 I.—C. H. Chearn, Gatwick Farm, Upper Gatton, Reigate, for 53500 **Garth Pansy**, born Jan. 1, bred by Col. G. H. Mytton, Garth; *s.* Ranksborough Saducee 15097, *d.* 40105 Old Prebendal Pansy *by* Shaw Hill Rennis 13209.

1389 II.—Sir Guy Hambling, Bart., Rookery Park, Yoxford, Suffolk, for 54936 **Yoxford Prune 4th**, born May 9; *s.* Ashmoor Sapper 15989, *d.* 35329 Bredfield Primrose 6th *by* Brettenham Gay Boy 12542.

1381 III.—His Majesty the King, Sandringham, Norfolk, for 54444 **Royal Chloe**, born Jan. 14, bred by His Majesty King George V; *s.* Hatton Faber 14151, *d.* 40228 Royal Fairy 2nd *by* Royal Crimson 11763.

1382 IV.—His Majesty the King, for 54449 **Royal Iris**, born Feb. 3, bred by His Majesty King George V; *s.* Hatton Faber 14151, *d.* 32960 Necton Daffodil *by* Marham Armistice 11410.

1390 V.—N. A. Heywood, Glevering Park, Wickham Market, Woodbridge, for 53551 **Glevering Hoopoe**, born July 12; *s.* Oulton Gauntlet 16234, *d.* 44475 Wissett Fairy *by* Horsley Soarer 14535.

1388 R.N.—Sir Guy Hambling, Bart., for **Yoxford Mavis 5th.**
H.C.—1395. C.—1383.

Class 189.—*Red Poll Heifers, born in* 1935.

1404 I.—N. A. Heywood, Glevering Park, Wickham Market ,Woodbridge, for 55788 **Glevering Dotterel**, born Feb. 27; *s.* Oulton Gauntlet 16234, *d.* 43828 Martlesham Pellet 2nd *by* Necton Cristal 13511.

1407 II.—Stuart Paul, Kirton Lodge, Ipswich, for 56180 **Kirton Christina**, born May 1; *s.* Mickleover Red Fox 15049, *d.* 37895 Kirton Christine *by* Cotswold Cayenne 12979.

1402 III.—J. G. Gray, Coombe Abbey, Coventry, for 54940 **Abbeycombe Kalmia**, born April 28; *s.* Abbeycombe Fabian 15561, *d.* 36870 Abbeycombe Baronia *by* Harefield Clinker 11000.

1409 IV.—The Hon. Clive Pearson, Parham, Pulborough, for 56544 **Parham Spice**, born Jan. 10; *s.* Seven Springs Quiver 15896, *d.* 40131 Parham Cinnamon *by* Basildon Rodney 13295.

1410 V.—Capt. C. S. Schreiber, Marlesford Hall, Woodbridge, for 56330 **Marlesford Daffodil**, born Jan. 1; *s.* Henham Hatter 16118, *d.* 48474 Yoxford Dora 3rd *by* Abbeycombe Drake 14747.

1397 R.N.—His Majesty the King, Sandringham, Norfolk, for **Royal Direction.**
H.C.—1408. C.—1406.
1319, 1388, 1389 Cup.[1]—Sir Guy Hambling, Bart., for **Yoxford Heath, Yoxford Mavis 5th, and Yoxford Prune 4th.**
1320, 1373, 1404 R.N. for Cup.[1]—N. A. Heywood, for **Glevering Hawk Owl, Glevering Siskin and Glevering Dotterel.**

Blue Albions.[2]

Class 190.—*Blue Albion Bulls, born in or before* 1934.

1416 I. & Champion.[3]—Charles Henry Webster, Ivonbrook Farm, Grange Mill, Derby, for **Ivonbrook Admiral 2001**, born Sept. 15, 1933; *s.* Ivonbrook Emperor 2005, *d.* Ivonbrook Dolly 12724.

1412 II. & R.N. for Champion.[3]—John Bassett, Hill Top Farm, Ashover, Derbyshire, for **Asherblue Dairyman 21051**, born April 28, 1934; *s.* Mount Martinstown 1909, *d.* Asherblue Barton 12534 *by* Barton Alderman.

1413 III.—W. E. Glover, The Shrubberies, Snarestone, Burton-on-Trent, for **Snarestone Fearless**, born June 4, 1934; *s.* Snarestone Jude 2045, *d.* Mount Crocus 3rd 12782 *by* Mount Fearless 1731.

1415 R.N.—Henry Matthews, Winterbourne, Bristol, for **Magna Prince.**
H.C.—1414.

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[1] The "Henham" Silver Challenge Cup given through the Red Poll Cattle Society for the best group of one Bull and two Cows or Heifers, bred by Exhibitor.

[2] £75 towards these Prizes were given by the Blue Albion Cattle Society.

[3] Perpetual Silver Challenge Cup given by the Blue Albion Cattle Society for the best Bull.

Class 191.—*Blue Albion Bulls, born in* 1935.

1418 I.—C. H. Goodwin, Boro Fields, Walton-on-Trent, Burton-on-Trent, for **Crossfields Viscount**, born Oct. 1; *s.* Snarestone Baron 1947, *d.* Crossfields Freda 12654 *by* Crossfields Majestic 1665.

1417 II.—W. E. Glover, The Shrubberies, Snarestone, Burton-on-Trent, for **Snarestone Baron 2nd**, born July 10; *s.* Snarestone Dandy 2039, *d.* Snarestone Creole 2nd 12366 *by* Barton Jude 2nd 1183.

1420 III.—Henry Matthews, Winterbourne, Bristol, for **Winterbourne What's Wanted**, born Jan. 29; *s.* Stow What's Wanted 1969, *d.* Winterbourne Daisy 8230.

1419 R.N.—Henry Matthews, for **Winterbourne Prince Ginger.**

Class 192.—*Blue Albion Cows or Heifers, in-milk, born in or before* 1933.

1422 **I. & Champion.**[1]—C. H. Goodwin, Boro Fields, Walton-on-Trent, Burton-on-Trent, for **Margaret 2nd of Crossfields**, born in Jan., 1932, calved June 3, 1936.

1421 **II. & R.N. for Champion.**[1]—W. E. Glover, The Shrubberies, Snarestone, Burton-on-Trent, for **Mount Crocus 3rd 12782**, born Aug. 11, 1929, calved June 7, 1936, bred by T. H. Swire & Sons, Mount Farm, Norton-in-Hales, Market Drayton; *s.* Mount Fearless 1731, *d.* Mount Crocus 2nd 9598.

1423 III.—Charles Henry Webster, Ivonbrook Farm, Grange Mill, Derby, for **Ivonbrook Fancy 13098**, born Aug. 15, 1932, calved May 28, 1936; *s.* Winthorpe Major 1979, *d.* Ivonbrook Lily.

Class 193.—*Blue Albion Heifers, born in* 1934.

1424 I.—John Bassett, Hill Top Farm, Ashover, Derbyshire, for **Asherblue Iris**, born Jan. 30; *s.* Mount Martinstown 1909, *d.* Asherblue Blossom 3rd 12982 *by* Asherblue Clansman 1829.

1427 II.—C. H. Goodwin, Boro Fields, Walton-on-Trent, Burton-on-Trent, for **Countess 2nd of Crossfields**, born Feb. 7.

1426 III.—John Bassett, for **Asherblue Tulip**, born Feb. 20; *s.* Mount Martinstown 1909, *d.* Asherblue Bella 2nd *by* Asherblue Clansman 1829.

1428 R.N.—Charles Henry Webster, Ivonbrook Farm, Grange Mill, Derby, for **Ivonbrook Dinah 2nd.**

Class 194.—*Blue Albion Heifers, born in* 1935.

1430 I.—W. E. Glover, The Shrubberies, Snarestone, Burton-on-Trent, for **Gem 2nd of Snarestone**, born May 23; *d.* Gem of Snarestone.

1429 II.—John Bassett, Hill Top Farm, Ashover, Derbyshire, for **Asherblue Bridget**, born May 25; *s.* Ridgewardine Herdsman 2033, *d.* Asherblue Bella 12540 *by* Barton Clarendon 1447.

British Friesians.

ABBREVIATIONS.—F.R.S., Friesch Rundvee Stamboek; N.R.S., Nederlandsch Rundvee Stamboek; P.I., Pure imported blood; S.A.S.B., South African Stud Book.

Unless otherwise stated, the numbers refer to the British Friesian Herd Book.

Class 195.—*British Friesian Bulls, born in or before* 1933.[2]

1435 **I. £20, Champion**[3] **& Champion.**[4]—The Trustees of Sir Alasdair W. MacRobert, Bart., Douneside, Tarland, Aberdeenshire, for **Douneside (imp. 1936) Lodewijk Bertus 7th 45841**, born March 3, 1933, bred by F. A. Bijlsma, Jelsum, Friesland; *s.* Bertus 2nd 19191 F.R.S., *d.* Ymkje 7th 61671 F.R.S. *by* Lodewijk 13921 F.R.S.

1433 **II. £15, R.N. for Champion**[3] **& R.N. for Champion.**[4]—Hodge Bros., Wyddial Bury, Buntingford, Herts., for **Terling Matrix 41339**, born Jan. 2, 1932, bred by Lord Rayleigh, The Bury, Hatfield Peverel; *s.* Terling (imp. 1922) Marthus 21533, *d.* Terling Trix 14th 110764 *by* Dunninald Haeayemairschaap 7699 P.I.

1432 III. £10.—F. W. Gilbert, The Manor, Chellaston, Derby, for **Glen Bushranger 2nd 40509**, born May 10, 1932, bred by Arthur Allen, Chesterblade, Somerset; *s.* Glen Bruce 37381, *d.* Bowerchalke Bud 50892 *by* Glen Taurus 9755.

H.C.—1437. C.—1431.

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[1] Perpetual Silver Challenge Cup given by the Blue Albion Cattle Society for the best Cow or Heifer.

[2] Prizes given by the British Friesian Cattle Society.

[3] Champion Prize of £10 given by the British Friesian Cattle Society for the best Bull.

[4] The "Mayford" Silver Challenge Trophy given through the British Friesian Cattle Society for the best Bull.

Class 196.—*British Friesian Bulls, born on or between January* 1 *and June* 30, 1934.

1441 I. & Champion.[1]—The Trustees of Sir Alasdair W. MacRobert, Bart., Douneside, Tarland, Aberdeenshire, for **Douneside Benachie 43835**, born Feb. 21; *s.* Lochlands Rijper 29237 P.I., *d.* Douneside Becula 6th 145896 *by* Douneside Masterpiece 19835.

1438 II.—G. J. Caddey, Manor House, Egham, Surrey, for **Lawford Norman 44291**, born Jan. 22, bred by B. Poole, Akenham Hall, Ipswich; *s.* Lawford Jonker 37683, *d.* Lawford Elizabeth 95658 *by* Norton (imp.) Taurus 4269.

1440 III.—F. W. Gilbert, The Manor, Chellaston, Derby, for **Oulton Glossy Boy 44517**, born April 15, bred by A. G. Mobbs, Swavesey Lodge, Oulton, Lowestoft; *s.* Terling Marksman 39787, *d.* Oulton Glossy 140164 *by* Oulton (imp. 1922) Officer 21127.

H.C.—1439.

Class 197.—*British Friesian Bulls, born on or between July* 1 *and December* 31, 1934.

1450 I.—G. B. Radcliffe, Pool Bank, Tarvin, Cheshire, for **Tarvin (imp. 1936) Arnold**, born Dec. 1, bred by J. Alberti, Ruinerwold, Holland; *s.* Zeus Kuilsburg 12788 N.R.S., *d.* Jantina 26th 172278 N.R.S. *by* Alldus 9487 N.R.S.

1442 II.—Mrs. C. Bayley, Willaston Hall, Nantwich, for **Willaston (imp. 1936) Jansje's Adema A7349**, born Nov. 14, bred by S. U. Lemstra, Scharnegoutum, Holland; *s.* Hiltje's Adema 19939 F.R.S., *d.* Jansje 60152 F.R.S. *by* Pel Rooske 11786 F.R.S.

1446 III.—W. T. & H. Forty, Northwoods Farm, Winterbourne, Bristol, for **Frampton Covert Ranger 43973**, born Aug. 24; *s.* Bowerchalke Pride 38529, *d.* Greville Rosemary 82294 *by* Greville Victor 17071.

1447 R.N.—Clifford W. H. Glossop, The Lund Dairies, Bramwith Hall, Doncaster, for **Terling Torment.**

H.C.—1448.

Class 198.—*British Friesian Bulls, born on or between January* 1 *and June* 30, 1935.

1453 I.—F. W. Gilbert, The Manor, Chellaston, Derby, for **Chellaston (imp. 1936) Aafje's Roland 45553**, born March 4, bred by C. Stapel, Hoogkarspel, Holland; *s.* Pel Rooske's Roland 13118 N.R.S., *d.* Aafje 14th 80112 N.R.S. *by* Blok Max 6th 9699 N.R.S.

1459 II.—G. B. Radcliffe, Pool Bank, Tarvin, Cheshire, for **Tarvin Captain 47111**, born Jan. 6; *s.* Denchworth Series 37217 P.I., *d.* Tarvin Wistful 172886 *by* Tarvin Janke's Mairschaap 33525 P.I.

1451 III.—J. W. Salter Chalker, Hinton Farm, Hurst, Twyford, Berks., for **Hintonhurst Silver King 46263**, born Jan. 2; *s.* Chaddesden Hollander 38643, *d.* Hintonhurst Silver Queen 157670 *by* Hardinghall Silver King 32861.

1456 R.N.—Bertram Parkinson, Creskeld Hall, Arthington, Leeds, for **Creskeld Pel Beatty 3rd.**

H.C.—1458.

Class 199.—*British Friesian Bulls, born on or between July* 1 *and December* 31, 1935.

1472 I.—G. R. Radcliffe, Pool Bank, Tarvin, Cheshire, for **Tarvin Sietske Mairschaap 47161 P.I.**, born Aug. 27; *s.* Tarvin Janke's Mairschaap 33525 P.I., *d.* Golf Sietske's Holl Pel 137156 P.I. *by* Northdean Hollander 8th 31637 P.I.

1466 II.—F. W. Gilbert, The Manor, Chellaston, Derby, for **Chellaston Duke 6th 45545**, born Aug. 28; *s.* Winnal Duke 41425, *d.* Royal Daffodil 4th 140970 *by* Hache Wizard 20183 P.I.

1468 III.—The Trustees of Sir Alasdair W. MacRobert, Bart., Douneside, Tarland, Aberdeenshire, for **Douneside Evan 3rd 45837**, born July 24; *s.* Douneside Marcellus 2nd 35647, *d.* Douneside Eva 103996 *by* Hache Apollo 22925 P.I.

1470 IV.—R. G. Posnett, Town Farm, Norley, Warrington, for **Hatchmere (imp. 1936) Max Roland 46209**, born July 19, bred by C. Stapel, Hoogkarspel, North Holland; *s.* Pel Rooske's Roland 13118 N.R.S., *d.* Bouman 10th 73158 N.R.S. *by* Blok Max 4th 8473 N.R.S.

1465 R.N.—George Gee, Ely Grange, Frant, Tunbridge Wells, for **Mayford General.**

C.—1474.

Class 200.—*British Friesian Cows, in-calf.*[2]

1480 I. & Champion.[3]—Mrs. Graham Rees-Mogg, Clifford Manor, Stratford-on-Avon, for **Cliffordchambers Friesia 135100**, born Sept. 14, 1929; *s.* Washway Premier 33615, *d.* Northdean May 2nd 96974 *by* Northdean (imp. 1922) Marthus Beatty 21081.

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[1] The "Douneside" Silver Challenge Cup given through the British Friesian Cattle Society for the best Bull, bred by Exhibitor.

[2] Prizes given by the British Friesian Cattle Society.

[3] Champion Prize of £10 given by the British Friesian Cattle Society for the best Cow or Heifer.

1477 II.—F. W. Gilbert, The Manor, Chellaston, Derby, for **Winterbourne Dotterell 2nd** 111610, born Oct. 29, 1926, bred by T. Mansfield, Winterbourne, Glos.; *s.* Commieston Bromley Ceres 22379 P.I., *d.* Eastern Dotterell 24346 *by* Monkton Answer 1773.

1481 III.—Mrs. Graham Rees-Mogg, for **Cliffordchambers Ione** 105444, born May 19, 1932; *s.* Washway Premier 33615, *d.* Northdean Barbara 2nd 108462 P.I. by Northdean Meibloem's Beatty 26679 P.I.

1479 R.N.—G. B. Radcliffe, Pool Bank, Tarvin, Cheshire, for **Tarvin Susette.**

H.C.—1483. C.—1482.

Class 201.—*British Friesian Cows, in-milk, born in or before* 1930, *having yielded a minimum of* 8,000 *lb. of milk during a lactation period of* 315 *days.*[1]

1487 I. £20.—W. Curtis & Son, Berwick Manor, Rainham, Essex, for **Ingatestone Myrtle Dewdrop** 117652, born Feb. 26, 1927, calved May 21, 1936, bred by the late E. Marriage, Blackmore, Essex; *s.* Northdean Myrtle Prince 14983, *d.* Ingatestone Dewdrop 72720 *by* Blackmore (imp.) Jonker 2539.

1491 II. £15.—Mrs. P. Tory, Shapwick, Blandford, for **Holyport Arline** 128084 P.I., born Oct. 2, 1928, calved June 15, 1936, bred by H. M. Martineau, Holyport, Berks.; *s.* Holyport Ceres 31209 P.I., *d.* Hache (imp. 1922) Arline 61924 *by* Kopjeskraal Marthus 3rd 2100 S.A.S.B.

1492 III. £10.—Mrs. P. Tory for **Penshurst Rosemary** 120118, born March 3, 1927, calved May 27, 1936, bred by A. G. Nye, The Priory, Hildenborough; *s.* Penshurst Froukje's Ceres 29599, *d.* Thurston Karel Lobelia 2nd 76984 *by* Kirkhill (imp.) Karel 2nd 4051.

Class 202.—*British Friesian Cows, in-milk, born in* 1931 *or* 1932, *having yielded a minimum of* 6,500 *lb. of milk during a lactation period of* 315 *days.*[2]

1497 I. £20.—George Gee, Ely Grange, Frant, Tunbridge Wells, for **Mayford Mars Hyphen** 159262, born June 28, 1931, calved May 3, 1936; *s.* Douneside Marcellus 34163, *d.* Herrington Hyphen 117230 *by* Herrington Ynte's Editor 26037.

1509 II. £15.—Mrs. Graham Rees-Mogg, Clifford Manor, Stratford-on-Avon, for **Cliffordchambers (imp. 1936) Maaike 97th** 198694, born Feb. 15, 1932, calved Dec. 30, 1935, bred by C. J. Blanksma, Pingjum, Holland; *s.* Cesar 18520 F.R.S., *d.* Maaike 73rd 69919 F.R.S. *by* Lucht en Veld Marius 15649 F.R.S.

1500 III. £10.—T. E. Gladstone, Margery Flatts, Lanchester, Co. Durham, for **Dignit Glossy** 155658, born May 1, 1931, calved May 31, 1936; *s.* Westonhall Johan 3rd 33625, *d.* Royds Glossie 75892 *by* Terling (imp. 1933) Marthus 21533.

1508 IV. £4.—G. B. Radcliffe, Pool Bank, Tarvin, Cheshire, for **Tarvin Waterlily** 172836, born Sept. 6, 1932, calved June 3, 1936; *s.* Denchworth Series 37217 P.I., *d.* Tarvin Rosemary 132136 *by* Tarvin (imp. 1922) Mazeppa 21507.

1494 R.N.—F. J. Carter, Gardeners' Farm, Baddow Road, Chelmsford, for **Bowerchalke Sweet Rose.**

H.C.—1504.

Class 203.—*British Friesian Heifers, in-milk to first calving, born in or after* 1933.[1]

1512 I.—F. W. Gilbert, The Manor, Chellaston, Derby, for **Chellaston (imp. 1936) Lindberg's Jeltje** 198380, born Sept. 16, 1933, calved Feb. 22, 1936, bred by P. van der Valk, Oosterend, Holland; *s.* Lindberg 17375 F.R.S., *d.* Nico's Jeltje 174357 F.R.S. *by* Nico Gerard 14124 F.R.S.

1513 II.—F. W. Gilbert, for **Saracens Eirene 3rd** 182968 P.I., born June 11, 1933, calved April 20, 1936, bred by J. R. Upson, Rush Court, Wallingford; *s.* Saracens Meibloem Don 38073 P.I., *d.* Saracens Princess Eirene 120962 P.I., *by* Northdean Hollander 5th 29479 P.I.

1514 III.—Clifford W. H. Glossop, The Lund Dairies, Bramwith Hall, Doncaster, for **Lund Superblanche Blanche** 180650, born Sept. 5, 1933, calved May 19, 1936; *s.* Lund Julibleanchty Superbus 37759, *d.* Lund Blanching's Blanche 148930 P.I. *by* Lund Blanche's Viking 33165 P.I.

Class 204.—*British Friesian Heifers, born on or between January* 1 *and June* 30, 1934.

1520 I.—W. H. R. Gilbert, The Cottage, Aston Flamville, Hinckley, for **Astonville Mystic 8th** 185390, born Feb. 15; *s.* Hardinghall Silver Knight 37503, *d.* Astonville Mystic 2nd 112234 *by* Tarvin Janke's Mazeppa 24357 P.I.

1521 II.—The Trustees of Sir Alasdair W. MacRobert, Bart., Douneside, Tarland, Aberdeenshire, for **Douneside Petunia** 188474, born Feb. 19; *s.* Dennistoun Jeringa 28811 P.I., *d.* Douneside Primula 2nd 155754 *by* Douneside Masterpiece 19835.

1516 III.—F. J. Carter, Gardeners' Farm, Baddow Road, Chelmsford, for **Chelmsford Pride 10th** 187134, born Jan. 23; *s.* Lawford Jachin 37667, *d.* Chelmsford Pride 4th 134908 *by* Buttsgreen Marthus 30603.

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[1] Prizes given by the British Friesian Cattle Society.

[2] Prizes, except Fourth and Fifth, given by the British Friesian Cattle Society.

1515 IV.—Arthur Allen, The Manor, Chesterblade, Somerset, for **Glen Squaw 5th** 189476, born Feb. 23; *s.* Glen Warrego 40519, *d.* Glen Squaw 3rd 156748 *by* Glen Akrin 31035.

1522 R.N.—G. B. Radcliffe, Pool Bank, Tarvin, Cheshire, for **Tarvin Veronica 2nd.**
H.C.—1518. C.—1517.

Class 205.—*British Friesian Heifers, born on or between July* 1 *and December* 31, 1934.

1525 I.—The Trustees of Sir Alasdair W. MacRobert, Bart., Douneside, Tarland, Aberdeenshire, for **Douneside Elma 2nd** 188454, born July 3; *s.* Lochlands Rijper 29237 P.I., *d.* Douneside Eva 103996 *by* Hache Apollo 22925 P.I.

1524 II.—W. H. R. Gilbert, The Cottage, Aston Flamville, Hinckley, for **Astonville Dairymaid 6th** 185376, born Sept. 6; *s.* Hardinghall Silver Knight 37503, *d.* Astonville Dairymaid 100798 *by* Iken (imp. 1922) Pel Beatty 23201.

Class 206.—*British Friesian Heifers, born on or between January* 1 *and June* 30, 1935.[1]

1537 I. & R.N. for Champion.[2]—Mrs. Graham Rees-Mogg, Clifford Manor, Stratford-on-Avon, for **Cliffordchambers Marcellus Lady** 198710, born Jan. 25; *s.* Douneside Marcellus 34163, *d.* Moordale Deborah 139636 *by* Hache Buringa 25871 P.I.

1536 II.—G. B. Radcliffe, Pool Bank, Tarvin, Cheshire, for **Tarvin Rowena 3rd** 206342, born April 23; *s.* Denchworth Series 37217 P.I., *d.* Tarvin Rowena 132138 *by* Mapleton Hilko's Ironclad 26511 P.I.

1531 III.—F. W. Gilbert, The Manor, Chellaston, Derby, for **Saracens Renske 9th** 205468 P.I., born April 9, bred by J. R. Upson, Rush Court, Wallingford; *s.* Someries Hercules 41231 P.I., *d.* Saracens Renske 3rd 141086 P.I. *by* Hache Buringy 25873 P.I.

1540 IV.—Miss S. Whitnall, Hill Farm, East Hanningfield, Chelmsford, for **Wheelers Sally 2nd** 207504, born June 2; *s.* Hales Burthelma 39063 P.I., *d.* Wheelers Sally 173654 *by* Cliffordchambers Gate Crasher 37093 P.I.

1529 V.—George Gee, Ely Grange, Frant, Tunbridge Wells, for **Mayford Mars Flora 3rd** 203410, born March 21; *s.* Douneside Marcellus 34163, *d.* Darren Flora 92122 *by* Commieston Abetschaap 19617 P.I.

1535 R.N.—Bertram Parkinson, Creskeld Hall, Arthington, Leeds, for **Creskeld Fannie 7th.**
H.C.—1539. C.—1526.

Class 207.—*British Friesian Heifers, born on or between July* 1 *and December* 31, 1935.[1]

1542 I.—A. J. Creed, Goldicote House, Stratford-on-Avon, for **Goldicote Ruth 12th** 201014, born Aug. 17; *s.* Hales Burika 35865 P.I., *d.* Goldicote Ruth 3rd 156874 *by* Douneside Isleman 3rd 34159.

1543 II.—W. Curtis & Son, Berwick Manor, Rainham, Essex, for **Barwyke Lady** 196988, born July 25; *s.* Saracens Dennis 38055 P.I., *d.* Ingatestone Lady 4th 179628 *by* Sands Fokke 10th 34923.

1545 III.—The Trustees of Sir Alasdair W. MacRobert, Bart., Douneside, Tarland, Aberdeenshire, for **Douneside Fiona 2nd** 199806, born Oct. 28; *s.* Terling Martinique 43071, *d.* Douneside Bertus Minna 92514 *by* Douneside Hatsumerschaap 13719.

1544 R.N.—James Kilpatrick, Craigie Mains, Kilmarnock, for **Craigiemains Annette.**
H.C.—1549. C.—1541.

1480, 1481, 1537 **Gold Medal**[3] **& Trophy.**[4]—Mrs. Graham Rees-Mogg, for **Cliffordchambers Friesia, Cliffordchambers Ione and Cliffordchambers Marcellus Lady.**

1477, 1512, 1531 **R.N. for Gold Medal.**[3]—F. W. Gilbert, for **Winterbourne Dotterell 2nd, Chellaston (imp. 1936) Lindberg's Jeltje and Saracens Renske 9th.**

1441, 1521, 1525 **R.N. for Trophy.**[4]—The Trustees of Sir Alasdair W. MacRobert, Bart., for **Douneside Benachie, Douneside Petunia and Douneside Elma 2nd.**

Ayrshires.

Class 208.—*Ayrshire Bulls, born before May* 1, 1934.

1550 I.—David Caldwell & Sons, Pennyfadzeoch, Cumnock, for **Howie's Expectation** 32886, born Oct. 28, 1932, bred by James Howie & Sons, Muirside, Dumfries; *s.* Kirkcudbright Footprints Last 30246, *d.* Howie's Damsel 6th 29828 *by* Millantae Carry On 23071.

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[1] Prizes, except Fourth and Fifth, given by the British Friesian Cattle Society.

[2] Champion Prize of £10 given by the British Friesian Cattle Society for the best Cow or Heifer.

[3] Gold Medal given by the British Friesian Cattle Society for the best group of three Cows or Heifers.

[4] Perpetual Bronze Challenge Trophy given by the Friesland Cattle Breeders' Association of South Africa for the best group of three British Friesians, bred by Exhibitor.

1551 II.—James Howie & Sons, Muirside, Dumfries, for **Barboigh Raider 35329**, born Jan. 23, 1934, bred by Alexander Watson, Barboigh, Mauchline; *s.* Lessnessock Ranger 30378, *d.* Barboigh Violet 4th 34073 *by* Hill Speculation 26908.

1552 III.—Leslie K. Osmond, Netherwood Dairy Farms, Bradley, Grimsby, for **Nether Craig Winsome Lad 34675**, born Sept. 29, 1933, bred by Alex. Cochrane, Nether Craig, Kilmarnock; *s.* Auchenbrain Celebrity 27535, *d.* Stannock Whitie 5th 39821 *by* Stannock Paymaster 29295.

Class 209.—*Ayrshire Bulls, born on or after May* 1, 1934.

1557 I.—Wyndham T. Vint, Thorn Cottage, Wroot, Doncaster, for **Millantae What's Wanted 36028**, born Oct. 19, 1934, bred by J. Johnstone, Millantae, Lockerbie; *s.* Howie's Ready Made 32515, *d.* Millantae White Poppy 13932 *by* Bargenoch Nugget 18484.

1556 II.—S. Ian MacDonald, Gullet Farm, South Pool, Kingsbridge, for **Bargower Advance 35677**, born Oct. 14, 1934, bred by J. N. Drummond, Bargower, Hurlford; *s.* Meikle-Kilmory Flashlight 34194, *d.* Bargower Cherry Fine 14th 37910 *by* Meikle-Kilmory Pansy 2nd 91249.

1554 III.—J. R. P. Hedley, Southcote Grange Farm, Reading, for **Cowichan Pilot**, born May 22, 1935, bred by R. M. Love, Downash, Flimwell, Kent; *s.* Hobsland Airman 32034, *d.* Thornhill Grace 2nd 34093 *by* Lessnessock Monomark 27718.

Class 210a.—*Ayrshire Cows, in-milk, born on or before May* 1, 1933.

1577 I. & Champion.[1]—James Howie & Sons, Muirside, Dumfries, for **Howie's Dairy Lass 3rd 44126**, born Sept. 27, 1931, calved June 28, 1936; *s.* Howie's Orange Pip 29892, *d.* Howie's Dairy Lass 17094 *by* Millantae Better Still 25796.

1578 II.—Robert Mackay, Bruchag, Rothesay, for **Bruchag Princess 53798**, born Aug. 25, 1932, calved June 29, 1936; *s.* Cauldhame Admiral 29600, *d.* Ballochmartin Audrey 2nd 16158 *by* Westburn Commander 25738.

1560 III. & R.N. for Champion.[2]—John Clark, Dunrod Farm, Inverkip, for **Dunrod Elf 3rd 47402**, born April 22, 1932, calved May 20, 1936; *s.* Dunrod Sir Jacob 27973, *d.* Dunrod Elf 9413 *by* Dunrod Aviator 20893.

1574 IV.—Trevor Greenshields, Over the Hill, Houghton-le-Spring, for **Barstibly Narcissus 3rd 38614**, born March 3, 1931, calved June 17, 1936, bred by Capt. J. B. Douglas, Barstibly, Castle Douglas; *s.* Barstibly Oscar 26769, *d.* Barstibly Narcissus 2194 *by* Barstibly Hector 18903.

1581 V.—Robert Sillars & Son, Ickham Court, Canterbury, for **Ickham Carol 6th 4969**, born June 2, 1932, calved May 27, 1936; *s.* Ickham Foundation 27011, *d.* Ickham Carol 10632 *by* Westburn Cupbearer 22197.

1573 R.N.—John F. Godwin, Manor Farm, North Aston, Oxford, for **Garrington Ruby 5th.**

Class 210b.—*Ayrshire Cows, in-calf, born on or before May* 1, 1933.

1575 I. & Champion.[2]—Trevor Greenshields, Over the Hill, Houghton-le-Spring, for **Craigraploch Cucumber 5th 31407**, born March 10, 1930, bred by Geo. Dunlop, Craigraploch, Castle Douglas; *s.* Meikle Knox Premier 25695, *d.* Craigraploch Cucumber 4th 7164 *by* Craigraploch Moneymusk 25050.

1571 II.—Eshott Pedigree Stock Farms, Felton, Northumberland, for **Eshott Joyous 45239**, born Oct. 24, 1931; *s.* South Craig Butter Fat 28148, *d.* Knockterra Joyce 12104 *by* Low Milton Donald 25442.

1559 III.—E. Binns Caldecott, Field House Dairy Farm, Houghton-le-Spring, for **Houghton Anita 47988**, born March 12, 1932; *s.* Herrington Duplicate 30799, *d.* Cowhill Nan 1209 *by* Catlinns Sensation 24929.

1567 R.N.—Capt. W. B. Dronsfield, The Manor House, Wilmcote, Stratford-on-Avon, for **Coldstream Polly.**

Class 211a.—*Ayrshire Heifers, in-milk, born after May* 1, 1933, *and before May* 1, 1934.[3]

1593 I.—James Howie & Sons, Muirside, Dumfries, for **Howie's Iona 2nd 58236**, born Aug. 15, 1933, calved June 23, 1936; *s.* Howie's Rich and Rare 25901, *d.* Cowhill Iona 2nd 23062 *by* Dunlop Irishman 23504.

1599 II.—A. W. Montgomerie, Westburn Farm, Cambuslang, for **Westburn Nannie 2nd 64579**, born Dec. 20, 1933, calved June 12, 1936, bred by Wilson & Montgomerie, Cambuslang; *s.* Bargower Union Jack 32106, *d.* Westburn Nannie 35075 *by* Lessnessock White Star 27728.

1598 III.—A. W. Montgomerie, for **Westburn Moss 48550**, born May 28, 1933, calved June 21, 1936, bred by Wilson & Montgomerie, Westburn Farm, Cambuslang; *s.* Bargenoch Blue Ribbon 31923, *d.* Cauldhame Moss 2nd 21253 *by* Cauldhame Marquis 26843.

1588 R.N.—Capt. W. B. Dronsfield, The Manor House, Wilmcote, Stratford-on-Avon, for **Darlingscott Actress.**

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[1] The "Cowhill" Silver Challenge Cup given through the Ayrshire Cattle Herd Book Society for the best Ayrshire.

[2] The "Oldner" Silver Challenge Cup given through the Ayrshire Cattle Herd Book Society for the best Cow or Heifer.

[3] Prizes given by the Ayrshire Cattle Herd Book Society.

Class 211b.—*Ayrshire Heifers, in-calf, born after May* 1, 1933, *and before May* 1, 1934.[1]

1585 **I. & R.N. for Champion.[2]**—JOHN CLARK, Dunrod Farm, Inverkip, for **Dunrod Honeysuckle 3rd** 60743, born July 1, 1933; *s.* Bargower Sprig o' Heather 33250, *d.* Dunrod Honeysuckle 2nd 36852 *by* Dunrod Sir Jacob 27973.

1592 **II.**—JAMES HOWIE & SONS, Muirside, Dumfries, for **Haughyett Antoinette 11th** 54212, born May 12, 1933, bred by Thomas Gilliland, Haughyett, Mauchline; *s.* Wemyss Niagara 30681, *d.* Haughyett Antoinette 5th 32385 *by* Auchinbay Emperor 26852.

1602 **III.**—ROBERT SILLARS & SON, Ickham Court, Canterbury, for **Ickham Eva 12th** 60093, born Oct. 4, 1933; *s.* Ickham Foundation 27011, *d.* Ickham Eva 2nd 19875 *by* Greenan Masterpiece 25328.

1597 **R.N.**—A. W. MONTGOMERIE, Westburn Farm, Cambuslang, for **Lessnessock Blue Legs.**

Class 212.—*Ayrshire Heifers, born on or after May* 1, 1934.

1613 **I.**—A. W. MONTGOMERIE, Westburn Farm, Cambuslang, for **Lessnessock Red Rose 10th** 64548, born Feb. 18, 1935; *s.* Bargower True Form 33129, *d.* Lessnessock Red Rose 9th 29562 *by* Lessnessock Sunny Jim 28457.

1608 **II.**—ALEXANDER COCHRANE, Nether Craig, Kilmarnock, for **Nether Craig Wish** 64230, born Sept. 27, 1934; *s.* Nether Craig Satisfaction 30043, *d.* Stannock White 5th 39821 *by* Stannock Paymaster 29295.

1607 **III.**—E. BINNS CALDECOTT, Field House Dairy Farm, Houghton-le-Spring, for **Houghton Doreen** 65809, born Dec. 13, 1934; *s.* Herrington Bassoon 32648, *d.* Hightae Barbara 36261 *by* Auchenbainzie Royal Review 24808

1614 **IV.**—A. W. MONTGOMERIE, for **Westburn Nancy 4th** 64578, born Feb. 18, 1935, bred by Wilson & Montgomerie, Cambuslang; *s.* Lessnessock Sunny Jim 28457, *d.* Westburn Nancy 2nd 35078 *by* Lessnessock Bohemian 24593.

1605 **V.**—WALTER ADAMSON, Harleyholm, Carmichael, Biggar, for **Harleyholm Etta 5th** 62328, born Nov. 9, 1934; *s.* Bargower True Form 33129, *d.* Harleyholm Etta 4th 35378 *by* Lessnessock Brown King 29153.

1609 **R.N**—JOHN F. GODWIN, Manor Farm, North Aston, Oxford, for **North Aston Misty.**

Guernseys.

N.B.—Unless otherwise stated, the numbers refer to the English Guernsey Herd Book.

Class 213.—*Guernsey Bulls, born in or before* 1933.

1619 **I., R.N. for Champion[3] & R.N. for Champion[4]**—W. DUNKELS, Fernhill Park, Windsor Forest, for **Fernhill Robert 5th** 7795, born April 28, 1929; *s.* Hindhead Robert 6th 5847, *d.* 14281 Downe Fleur de Vimiera *by* Valentine's Honour of the Passee 3826.

1626 **II.**—ERIC H. ROSE, Leweston Manor, Sherborne, for **Leweston Rose Lad 6th** 10529, born July 3, 1933; *s.* Leweston Rose Lad 7790, *d.* 29320 Lady Easter of La Rue *by* Sam of Le Fort 4409 P.S.

1620 **III.**—SIR W. H. N. GOSCHEN, BART., K.B.E., Durrington House, Harlow, for **Durrington May Bird 4th** 9915, born Sept. 10, 1932; *s.* Tregonning May Bird 3rd 7788, *d.* 30498 Lady Bijou of Long Camps *by* Clara's Rambler of Maple Lodge 9858.

1617 **IV.**—COPO, LTD., Home Farm, Cockayne Hatley, Potton, Beds., for **Violet's Valentine 2nd of Chouet** 11803, born April 30, 1931, bred by Y. Toudie, Chouet, Vale, Guernsey; *s.* Bickleigh Laddie 5653 P.S., *d.* 28476 P.S. Violet 2nd of the Chouet *by* Gem's Conqueror 5112 P.S.

1624 **V.**—WALTER PENROSE, Trewavas Farm, Breage, Helston, for **Foundry Daylight** 8242, born Feb. 3, 1930, bred by A. Clarke, Foundry Farm, Hayle, Cornwall; *s.* Trewavas Rival 2nd 6197, *d.* 20039 Little Gloweth Twilight *by* Scorrier Bullfinch 4309.

1629 **R.N.**—MR. AND MRS. E. E. THORNTON, Hampton, Seale, Farnham, for **Majestic of King's Mills.**

H.C.—1618, 1623, 1628. **C.**—1625.

Class 214.—*Guernsey Bulls, born in* 1934.

1638 **I., Champion[3] & Champion.[4]**—H. B. TURNER, Malverleys, Newbury, for **Malverleys King's Fancy 3rd** 10609, born Jan. 21; *s.* Bladen Rose Lad 8th 9111, *d.* 28555 Candies Fancy *by* Queen's Fancy 4038.

1631 **II.**—R. G. CAMPBELL, Great Hollanden, Underriver, Sevenoaks, for **Rose Lad of Pickhurst** 10641, born Jan. 17; *s.* Bladen Rose Lad 8401, *d.* 34116 Pickhurst Rosey *by* Pickhurst Sequels Delight 7317.

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[1] Prizes given by the Ayrshire Cattle Herd Book Society.

[2] The "Cowhill" Silver Challenge Cup given through the Ayrshire Cattle Herd Book Society for the best Ayrshire.

[3] Champion Prize of £5 given by the English Guernsey Cattle Society for the best Bull.

[4] The "Calehill" Silver Challenge Cup given by the English Guernsey Cattle Society for the best Bull.

1635 III.—Mrs. J. Sutcliffe Pyman, Norsebury, Sutton Scotney, Hants., for **Fernhill Robert 11th 10744**, born May 3, bred by W. Dunkels, Fernhill Park, Windsor Forest; *s.* Fernhill Robert 5th 7795, *d.* 18813 Fernhill Rose *by* Murrell Desmond 4263.

1630 IV.—Mrs. Cecil Bradshaw, Bystock, Exmouth, for **Bystock Valerius Dot 10916**, born June 1; *s.* Lady's Admiral des Osmonds 9823, *d.* 23400 Ely Dot *by* Lady's Honour 4833 P.S.

1632 R.N.—Capt. Cosmo Douglas, Hazelby, Newbury, for **Rosie's Souvenir de Vimiera.**
H.C.—1633, 1636. C.—1634, 1637.

Class 215.—*Guernsey Bulls, born in* 1935.

1641 I.—W. Dunkels, Fernhill Park, Windsor Forest, for **Fernhill Robert 18th 11339**, born April 12; *s.* Fernhill Robert 7th 9985, *d.* 41137 Fernhill Rose 7th *by* Fernhill Slogan 3rd 8815.

1652 II.—Mrs. Howard Palmer, Heathlands, Wokingham, for **Golden Tips Jewel 2nd of La Houguette 11937**, born Feb. 2, bred by E. F. J. Torode, La Houguette, Castel, Guernsey; *s.* Gems Successor 5205, P.S. *d.* 31708 Golden Tip of La Houguette *by* Tips Sequel of Meadow View 5374 P.S

1656 III.—Mrs. J. Sutcliffe Pyman, Norsebury, Sutton Scotney, Hants., for **Norsebury Sequel's Souvenir 11374**, born April 24; *s.* Norsebury Lodestar 17th 9324, *d.* 40165 Sequel's May Belle 6th *by* Honoria's Souvenir 5530 P.S

1659 IV.—Mr. and Mrs. E. Thornton, Hampton, Seale, Farnham, for **Fernhill Robert 17th 11338**, born April 1, bred by W. Dunkels, Fernhill Park, Windsor Forest; *s.* Fernhill Robert 7th 9985, *d.* 41354 Fernhill Rosey *by* Foremost Valor 8590.

1658 V.—Lord Swaythling, Townhill Park, West End, Southampton, for **Fernhill Robert 16th 11337**, born March 27, bred by W. Dunkels, Fernhill Park, Windsor Forest; *s.* Fernhill Robert 5th 7795, *d.* 18813 Fernhill Rose *by* Murrell Desmond 4263.

1642 R.N.—H. A. Y. Dyson, Dalton, Bolney, Sussex, for **Payhay's Baby Polly.**
H.C.—1639, 1645, 1655. C.—1646, 1661.

Class 216.—*Guernsey Cows, in-milk, born in or before* 1931.

1662 I. & Champion.[1]—Capt. Cosmo Douglas, Hazelby, Newbury, for **24856 Hazelby Meadow Sweet**, born Sept. 16, 1926, calved May 10, 1936; *s.* Hindhead Robert 4th 5488, *d.* 17499 Clatford Meadow Sweet 15th *by* Clatford Rosie's Sequel of Vimiera 3872.

1663 II.—W. Dunkels, Fernhill Park, Windsor Forest, for **28078 Fernhill Starlight 3rd**, born April 17, 1928, calved June 18, 1936; *s.* Rose Lad of Goodnestone 3163, *d.* 20224 Fernhill Starlight *by* Murrell Desmond 4263.

1682 III.—H. B. Turner, Malverleys, Newbury, for **36276 Malverleys May Rose**, born July 1, 1931, calved May 24, 1936; *s.* May Rose Cherub of Spurs 7729, *d.* 24634 Rushington Silver Princess 5th *by* Armsworth Robert 4675.

1666 IV.—Gilbert S. James, Hill End, Henbury, Bristol, for **36101 Filossette**, born April 13, 1931, calved June 15, 1936; *s.* Coutanchez Dandy 8328, *d.* 27073 Swallowcliff Flossy 3rd *by* President 3rd of Vimiera 4903.

1675 V.—Mrs. J. Sutcliffe Pyman, Norsebury, Sutton Scotney, Hants., for **26972 Sequel's May Belle 4th**, born July 6, 1927, calved June 8, 1936, bred by Mrs. A. Le Patourel, La Ramee, St. Peter Port, Guernsey; *s.* Galaxy's Slogan 8405, *d.* 16132 P.S. Sequel's May Belle *by* Honoria's Sequel 2nd 2816 P.S.

1671 R.N.—Mrs. E. Mansfield, Haberfield Hall, Easton-in-Gordano, Somerset, for **Tyndall Park Nellie's Sequence 2nd.**
H.C.—1665. C.—1664.

Class 217.—*Guernsey Cows or Heifers, in-milk, born in* 1932 *or* 1933.[2]

1684 I. & R.N. for Champion.[1]—W. Dunkels, Fernhill Park, Windsor Forest, for **41195 Fernhill Rose 8th**, born March 29, 1933, calved June 18, 1930; *s.* Fernhill Robert 5th 7795, *d.* 18813 Fernhill Rose *by* Murrell Desmond 4263.

1683 II.—Capt. Cosmo Douglas, Hazelby, Newbury, for **42951 Sylvia of Rocque Balan**, born Oct. 30, 1932, calved June 14, 1936; bred by J. Stacey, Rocque Balan, Vale, Guernsey; *s.* Rambler of Helvetia 5642 P.S., *d.* 30315 Polly 2nd of Rocque Balan *by* Mystery's Leader 5318 P.S.

1688 III. & Champion.[3]—Carl Holmes, Clover Top Farm, Codicote, Hitchin, for **39325 Dairy Queen 3rd of Clover Top**, born June 25, 1932, calved Feb. 2, 1936; *s.* Gem's Conqueror 2nd 7048, *d.* 32102 Dairy Queen of Clover Top *by* Victor of Les Grantes 5813.

1699 IV.—G. F. Dee Shapland, Green Farm, Claverham, Bristol, for **42443 Lily's Lilac of Les Norgiots**, born Feb. 25, 1933, calved June 28, 1936, bred by C. W. Browning, Les Norgiots, Guernsey; *s.* May Rose Cavalier of the Spurs 5941 P.S., *d.* 27296 P.S. Lily's Beauty 3rd of the Mourants *by* May Rose Lad of the Spurs 6153.

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[1] Champion Prize of £5 given by the English Guernsey Cattle Society for the best Cow or Heifer.

[2] Prizes, except Fourth and Fifth, given by the English Guernsey Cattle Society.

[3] The "Fernhill" Silver Challenge Cup given by the English Guernsey Cattle Society for the Cow or Heifer, in-milk, gaining highest number of points on inspection, and in the Milking Trials and Butter Tests.

1701 V.—LORD SWAYTHLING, Townhill Park, West End, Southampton, for 38929 **Bladen Gay Lass 2nd**, born May 15, 1932, calved Jan. 31, 1936, bred by Sir Ernest Debenham, Bart., Bladen, Briantspuddle, Dorset; *s.* Milton Rose Lad 7330, *d.* 14828 Tregothnan Gay Lass *by* Nicolle's Fleurie Sequel 3378.

1693 R.N.—A. THOMAS LOYD, Lockinge House, Wantage, for **Lockinge Goldfinch 3rd.**
H.C.—1686, 1698. C.—1689, 1696.

Class 218.—*Guernsey Heifers, born in* 1934.

1707 I.—CARL HOLMES, Clover Top Farm, Codicote, Hitchin, for 44658 **Rosey 2nd of Clover Top**, born March 25; *s.* Fernhill Robert 6th 9465, *d.* 21280 Rosey of Goodnestone 20th *by* Sequel's Slogan 2nd 4311.
1709 II.—G. H. JOHNSTONE, Trewithen, Grampound Road, Cornwall, for 44212 **Trewithen Zephyr**, born Jan. 9; *s.* Wintergreens Sequel 4th of Rusper 7967, *d.* 29339 Trewithen Tambourine *by* Governor 3rd of the Frie 7213.
1704 III.—MRS. CECIL BRADSHAW, Bystock, Exmouth, for 47072 **Valentine's Grace 5th of Cartaret**, born Jan. 27, bred by P. H. Nant, Cartaret, Castel, Guernsey; *s.* Hope's Rex 6096 P.S., *d.* 26556 Valentine's Grace of Cartaret *by* Valentine's Souvenir 4788 P.S.

1716 R.N.—LORD SWAYTHLING, Townhill Park, West End, Southampton, for **Moss Rose 6th of Les Houards.**
H.C.—1715. C.—1712.

Class 219.—*Guernsey Heifers, born in* 1935.

1733 I.—ERIC H. ROSE, Leweston Manor, Sherborne, for 47972 **Leweston Verenna 2nd**, born April 29; *s.* Leweston May Rose Lad 10524, *d.* 40928 Leweston Verenna *by* Drum Major 2nd of Le Casrouge 7771.
1717 II.—W. DUNKELS, Fernhill Park, Windsor Forest, for 47508 **Fernhill Rosey 2nd**, born March 4; *s.* Fernhill Fobert 5th 7795, *d.* 34521 Rosey of Goodnestone 52nd *by* Sequel's Slogan 2nd 4311.
1718 III.—H. A. Y. DYSON, Dalton, Bolney, Sussex, for 48279 **Poppy of Payhay**, born June 17; *s.* Coquet's Galaxy of Payhay 9795, *d.* 39535 Valentine's Queen of Payhay *by* Lenore's Souvenir de Vimiera 5703 P.S.
1732 IV.—ERIC H. ROSE, for 48556 **Leweston May Rose 2nd**, born July 14; *s.* Leweston Rose Lad 7790, *d.* 35110 Lily's May Rose 3rd *by* Sunrise of Maple Lodge 5569 P.S.
1728 V.—MRS. HOWARD PALMER, Heathlands, Wokingham, for 48338 **Murrell Rosey 2nd**, born June 26; *s.* Rashleigh's Dairyman 2nd 9533, *d.* 31545 Rosey of Goodnestone 46th *by* Sequel's Slogan 2nd 4311.

1721 R.N.—CARL HOLMES, Clover Top Farm, Codicote, Hitchin, for **May Blossom of Clover Top.**
H.C.—1722, 1723. C.—1729, 1730, 1737.

Jerseys.

N.B.—In the Jersey Classes, the number inserted within brackets after the name of an animal indicates the number of such animal in the Island Herd Book. A number without brackets indicates that the animal is registered in the English Jersey Herd Book.

Class 220.—*Jersey Bulls, born in or before* 1933.

1746 I. & Champion.[1]—JAMES W. MCCALLUM, Grange Farm, Chartridge, Chesham, for **Samares Cute Prince 19064**, born Sept. 6, 1932, bred by Sir James Knott, Bart., Samares Manor, Jersey; *s.* Valiant of Oaklands (5638), *d.* (38672) Cute 33rd *by* Willonyx Peer Lad (6231).
1751 II. & R.N. for Champion.[1]—WILLIAM E. PRESS, Wolvers, Reigate, for **Wolvers Rufus 17968**, born May 14, 1932; *s.* Hook Cæsar 17198, *d.* 9717 Margawse *by* Palatine's Observer 15400.
1748 III.—OVALTINE DAIRY FARM, Abbots Langley, Herts., for **The Wizard 18417**, born July 19, 1933, bred by Lady Violet Henderson, Buscot Park, Faringdon; *s.* Wotton Hustler 16500, *d.* 12461 Circe *by* The Slasher 14143.
1741 IV.—MRS. G. J. CADDEY, Manor House, Egham, Surrey, for **Egham Jester 17698**, born July 31, 1932; *s.* Daisy's Bright Pioneer 18006, *d.* 18474 Jester's Beauty *by* Royal Jester 16648.

1750 R.N.—W. HUMPHRYS PRESCOTT, Highlands, Woldingham, Surrey, for **Fairseat Gnome.**
H.C.—1743, 1752.

Class 221.—*Jersey Bulls, born in* 1934.

1768 I.—HAYDON STEPHEN-FOX, Sharelands, Blackboys, Uckfield, for **Prince Charming 18870**, born June 21, bred by Lady Violet Henderson, Buscot Park, Faringdon; *s.* Throve 17936, *d.* 17980 The Vamp *by* Wotton Hustler 16500.

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[1] Champion Prize of £5 given by the English Jersey Cattle Society for the best Bull.

1757 II.—Ovaltine Dairy Farm, Abbots Langley, Herts., for **Roseland Monarch**, born Feb. 27, bred by Carlyle Le Gallais, St. Saviours, Jersey; *s.* Roseland Willonyx Peer (6848), *d.* (41787) Hamptonne Melody *by* Igo Volunteer (6554).
1760 III.—William E. Press, Wolvers, Reigate, for **Wolves Majesty's Prince 18955**, born March 16; *s.* Wolves Rufus 17968, *d.* 3647 Majesty's Zenith *by* Sybil's Financial Jolly 14470.
1761 IV.—The Ladies Constance Ryder & Audrey Anson, Knowle, Dunster, Somerset, for **Noble's Dreamer 19643**, born April 18, bred by Ernest Queree, St. Peter, Jersey; *s.* Dreaming Nobleman (6931), *d.* (43253) Noble's Gazelle *by* Noble Aim (6563).
1754 V.—Miss Marjory G. Barrow, Normanton Hall, Southwell, for **Keeper's Dreamer** 19624, born Nov. 20, bred by F. P. Syvret, St. Mary, Jersey; *s.* Doreen's Dreamer (6846), *d.* (39487) Keeper's Lass *by* The Keeper (6376).

1762 R.N.—G. L. Savill, Rapsgate Park, Cirencester, for **Vinchelez Duke Charles.**

Class 222.—*Jersey Bulls, born in* 1935.

1770 **I. & Champion.**[1]—Mrs. A. M. Hall, Shipton-under-Wychwood, Oxford, for **The Mink 19518**, born April 19; *s.* Wotton Traveller 17467, *d.* 15068 Wotton Early Minx *by* Henbury Sunrise 15873.
1781 II.—William E. Press, Wolvers, Reigate, for **Wolvers Stylish Lad 19564**, born Feb. 4; *s.* Wolvers Rufus 17968, *d.* 18588 Ronald's Royal Dream *by* Right Royal 16642.
1776 III.—Mark F. North, Loxwood House, Billingshurst, for **Loxwood Monarch 19369**, born April 26; *s.* Kingston Gay Parade 17781, *d.* 13465 Kentwins Katisha *by* Kentwins Poppy's Aroma 16453.
1779 **IV. & R.N. for Champion.**[1]—Ovaltine Dairy Farm, Abbots Langley, Herts., for **Ovaltine Liberty's Dream 19420**, born May 3; *s.* Liberty 17787, *d.* 24886 Queen's Dream Lady *by* Ixia's Dreamer (6538).
1785 V.—The Hon. Mrs. Esme Smyth, Ashton Court, Bristol, for **Ashcourt Brave 19107**, born July 15; *s.* Bessie's Sultan 17608, *d.* 19441 Dusk *by* Danbury It's Meadowsweet 17090.

1780 R.N.—W. Humphrys Prescott, Highlands, Woldingham, Surrey, for **Bollhayes Mary's Prince.**
H.C.—1768, 1774, 1784.

Class 223.—*Jersey Cows, in-milk, born in or before* 1932.

1814 **I. & Champion.**[2]—Mark F. North, Loxwood House, Billingshurst, for **18620 South View Olivia**, born May 31, 1929, calved April 5, 1936, bred by P. F. Baudains, Jersey; *s.* Taxpayer 16487, *d.* (34335) Olinda's Beauty 8th *by* Ranulph 14428.
1822 **II. & R.N. for Champion.**[2]—William E. Press, Wolvers, Reigate, for **27995 Diamond Buckle**, born May 14, 1932, calved May 12, 1936, bred by E. J. Le Bailly, St. Brelade, Jersey; *s.* Cock Robin 2nd (6816), *d.* (39765) Vesla *by* Coronation Lad of La Haule (6450).
1802 III.—Sir John B. Lloyd, Foxbury, Stone Street, Sevenoaks, for **18340 Arkona's Viscountess (imp.)**, born March 18, 1929, calved May 26, 1936, bred by J. A. Romerll, St. Peters, Jersey; *d.* Floral Dance's You'll Do 16568, *s.* (26642) Arkona 4th *by* April Wonder 12826.
1801 IV.—Mrs. Henry Hawkins, Everdon Hall, Daventry, for **13051 Gold Bell**, born Nov. 9, 1931, calved March 16, 1936, bred by Mrs. Simonds, Wellesbourne Hall, Warwick; *s.* Gold Coin 16443, *d.* 15340 Seadua May Belle *by* Sybil's Oxford Baron 15788.
1818 V.—Ovaltine Dairy Farm, Abbots Langley, Herts., for **24866 Queen's Dream Lady**, born Feb. 25, 1931, calved May 2, 1936, bred by L. P. Merket, Jersey; *s.* Ixia's Dreamer 6538, *d.* 36670 Queen's March Lady *by* Standard of Oaklands 6071.

1803 R.N.—Sir John B. Lloyd, for **Neath 16th.**
1821 **R.N. for Specials.**[3]—W. Humphrys Prescott, for **Gnome's Sweetbread of Highlands.**
H.C.—1809, 1816, 1821, 1827.

Class 224.—*Jersey Heifers, in-milk, born in* 1933.

1849 I.—Miss G. M. Yule, Hanstead House, Bricket Wood, St. Albans, for **Lucky Baby Girl**, born Dec. 6, calved March 31, 1936, bred by P. Morin, St. Peters, Jersey; *s.* Samaritan (6778), *d.* (37324) Busy Baby.

1842 II.—Mark F. North, Loxwood House, Billingshurst, for **Sunflower of La Hanniere**, born Nov. 21, calved April 10, 1936, bred by J. N. Marrett, Jersey; *s.* It of Oaklands (6561), *d.* Sunflower of St. Lawrence (41503) *by* Mytilda's Beau 3rd (6493).

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[1] The "Meridale" Perpetual Silver Challenge Cup given through the English Jersey Cattle Society for the best yearling Bull from recorded dam.

[2] Champion Prize of £5 given by the English Jersey Cattle Society for the best Cow or Heifer.

[3] Special Prizes of £10 (First Prize) and £5 (Second Prize) given by the English Jersey Cattle Society for the best Cows or Heifers in Classes 223 to 225, bred by Exhibitor, and milked out to the Judge's satisfaction before being judged.

1843 III.—Ovaltine Dairy Farm, Abbots Langley, Herts., for 28209 **La Sente's Lady Draconis**, born Feb. 19, calved April 18, 1936, bred by P. & O. Bree, Grouville, Jersey *s.* Wonderful Standard 16207, *d.* 31468 Star Draconis *by* You'll Do's Volunteer 14832

1848 R.N. & Special I.[1]—The Hon. Mrs. Esme Smyth, Ashton Court, Bristol, for **Dusk.**
H.C.—1840, 1847.

Class 225.—*Jersey Heifers, in-milk, born in* 1934.[2]

1855 I.—Mark F. North, Loxwood House, Billingshurst, for **Zeno's Wonderful Girl**, born Jan. 7, calved March 16, 1936, bred by H. N. Renouf, Jersey; *s.* Louise's Wonderful (6909), *d.* (36242) Zeno *by* Signal of Oaklands (5979).

1857 II.—Ovaltine Dairy Farm, Abbots Langley, Herts., for **Victor's Lustrous Princess 4th**, born March 23, calved June 3, 1936, bred by Frs. Le Lievre, St. Martin, Jersey; *s.* Oxfordia's Lad (6337), *d.* (40552) Victor's Lustrous Princess 3rd *by* Royal Jester (6422).

1858 III.—Lt.-Col. T. S. Paterson, Lower Barford, Bramshaw, Hants., for **Gentle Yesno**, born April 20, calved April 28, 1936, bred by J. S. Bisson, St. John, Jersey; *s.* Kabul (6622), *d.* (42253) Gentle Xenia's Fillpail.

1861 IV. & Special II.[1]—Mrs. Hayes Sadler, Charlton Abbotts, Andoversford, Glos., for 22304 **Charlton Abbotts Ulrica**, born June 6, calved June 10, 1936; *s.* Cæsar 17064, *d.* 15898 Charlton Abbotts Oxford's Ulrica *by* Velveteen's Oxford 17434.

1852 R.N.—Gordon McWilliam, Dunwood Manor Farm, Romsey, Hants., for **Rochette's Volunteer's Sybil.**
H.C.—1859.

Class 226.—*Jersey Heifers, born in* 1935.

1882 I.—The Hon. Mrs. Esme Smyth, Ashton Court, Bristol, for 25109 **Ashcourt Beauty**, born April 25; *s.* Danbury It's Meadowsweet 17090, *d.* 17878 Sultan's Starstone *by* Kingston Golden Sultan 16894.

1867 II.—Mrs. Henry Hawkins, Everdon Hall, Daventry, for 26756 **Marston Minnie**, born June 3, bred by W. Wilkins, Long Marston, Tring; *s.* Reveller 19059, *d.* 24737 Josephine Snowflower (imp.) *by* Brampton Beau 16813.

1868 III.—Lady Violet Henderson, Buscot Park, Faringdon, for 25458 **Budget Deficit**, born May 5; *s.* Noble Statesman 18339, *d.* 17768 Spendthrift *by* Wotton Hustler 16500.

1883 IV.—The Hon. Mrs. Esme Smyth, for 25116 **Ashcourt Bow**, born May 27; *s.* Bessie's Sultan 17608, *d.* 14273 Rainbow *by* Lingen Flying Dutchman 16165.

1870 V.—Sir John B. Lloyd, Foxbury, Stone Street, Sevenoaks, for 26019 **Foxbury Verbena**, born March 26; *s.* Rosebay's X 19062, *d.* 14826 Valentine's Countess *by* Viscount of Oaklands 16688.

1876 R.N.—Ovaltine Dairy Farm, Abbots Langley, Herts., for **Ovaltine Liberty's Mercedes.**
H.C.—1877, 1879, 1880.
Cup.[3]—Mark F. North.
R.N. for Cup.[3]—William E. Press.

Kerries.

N.B.—In the Kerry Classes, the number inserted within brackets after the name of an animal indicates the number of such animal in the Royal Dublin Society's Herd Book. A number without brackets indicates that the animal is registered in the British Kerry Herd Book.

Class 227.—*Kerry Bulls, born in or before* 1934.

1890 I. & Champion.[4]—Lt.-Col. J. A. Innes, D.S.O., Horringer Manor, Bury St. Edmunds, for **Brookwood Egbert** 963, born Aug. 5, 1933, bred by Bertram W. A. Watney, Brookwood Corner, Holmwood, Surrey; *s.* Cheselbourne Gabriel 881, *d.* Montalto Kathlina of O.P.H. 4168 *by* North Star of Carton 516.

1893 II.—Bertram W. A. Watney, Brookwood Corner, Holmwood, Surrey, for **Cheselbourne Gabriel** 881, born Jan. 8, 1930, bred by Mrs. Freeland, Cheselbourne Manor, Dorset; *s.* Valencia Minstrel 667, *d.* Cheselbourne Garland 4328 *by* Duv Demon 640.

1892 III.—Newton R. Steel, Hookland Estate, Scaynes Hill, Haywards Heath, for **Hookland Emperor**, born April 30, 1934; *s.* Ard Caein Ultimo 920, *d.* Pallas Victoria 5044 *by* Valencia Czar 534.

1891 R.N.—H. E. Mitchell, Great Pellingbridge Farm, Scaynes Hill, Haywards Heath, for **Valencia Roland.**

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[1] Special Prizes of £10 (First Prize) and £5 (Second Prize) given by the English Jersey Cattle Society for the best Cows or Heifers in Classes 223 to 225, bred by Exhibitor, and milked out to the Judge's satisfaction before being judged.

[2] Prizes, except Fourth, given by the English Jersey Cattle Society.

[3] The "Conyngham" Perpetual Silver Challenge Cup given through the English Jersey Cattle Society for the most points awarded in a combination of entries.

[4] Silver Challenge Cup given by the British Kerry Cattle Society for the best Kerry.

Class 228.—*Kerry Bulls, born in* 1935.

1898 I.—BERTRAM W. A. WATNEY, Brookwood Corner, Holmwood, Surrey, for **Brookwood George** 1006, born April 26; *s.* Cheselbourne Gabriel 881, *d.* Minley Evelyn 4384 *by* Hattingley Arthur 588.

1897 II.—NEWTON R. STEEL, Hookland Estate, Scaynes Hill, Haywards Heath, for **Hookland Foreman,** born May 3; *s.* Ard Caein Ultimo 920, *d.* Gort Tulip 4939 *by* Pallas Rover 659.

1895 III.—THE KERRY COW DAIRY FARMS, Layer-de-la-Haye, Colchester, for **Hookland Friday,** born April 18, bred by Newton R. Steel, Hookland Estate, Scaynes Hill, Haywards Heath; *s.* Ard Caein Ultimo 920, *d.* Pallas Victoria 5044 *by* Valencia Czar 534.

1894 R.N.—LT.-COL. J. A. INNES, D.S.O., Horringer Manor, Bury St. Edmunds, for **Horringer Doeboy.**

Class 229.—*Kerry Cows, in-milk, born in or before* 1932.

1899 **I. & R.N. for Champion.**[1]—LT.-COL. J. A. INNES, D.S.O., Horringer Manor, Bury St. Edmunds, for **Ard Caein Doe** 5506, born Dec. 23, 1930, calved May 31, 1936, bred by S. J. Brown, Ard Caein, Naas, Co. Kildare; *s.* Ard Caein Secundus 749, *d.* Ard Caein Dove 3331 *by* Ard Caein Prince 6th 428.

1902 II.—NEWTON R. STEEL, Hookland Estate, Scaynes Hill, Haywards Heath, for **Hookland Angela** 5410, born Jan. 12, 1930, calved April 30, 1936; *s.* Big Demand of Carton 821, *d.* Pallas Moira 5038 *by* Pallas Pat (1142).

1903 III.—BERTRAM W. A. WATNEY, Brookwood Corner, Holmwood, Surrey, for **Brookwood Anne** 4689, born Dec. 21, 1929, calved May 6, 1936; *s.* Chaldon Hornet 758, *d.* Chaldon Countess 2nd 3825 *by* Castle Lough Eddie 549.

1900 R.N.—THE KERRY COW DAIRY FARMS, Layer-de-la-Haye, Colchester, for **Drumgaunagh Eliza.**

Class 230.—*Kerry Heifers, in-milk, born in* 1933 *or* 1934.

1904 I.—MISS HONOR G. B. BOWEN-COLTHURST, Vernons, Chappel, Colchester, for **Buckland Juno** 5816, born Feb. 16, 1933, calved Jan. 17, 1936, bred by Lady Fitzgerald, Buckland, Faringdon; *s.* Ard Caein Lictor 919, *d.* Buckland Cherry Ripe 3791 *by* Minley Major 513.

1905 II.—H. E. MITCHELL, Great Pellingbridge Farm, Scaynes Hill, Haywards Heath, for **Barrington Tulip 3rd** 5801, born Jan. 19, 1934, calved April 21, 1936; *s.* O.P.H. Pailful Curley 848, *d.* Barrington Tulip 5112 *by* Pallas Earl 903.

1908 III.—BERTRAM W. A. WATNEY, Brookwood Corner, Holmwood, Surrey, for **Brookwood Glentime Emily** 5521, born Oct. 23, 1933, calved May 3, 1936; *s.* Cheselbourne Gabriel 881, *d.* O.P.H. Glentime Queen 4177 *by* O.P.H. Rathmore Time 605.

Dexters.

N.B.—In the Dexter Classes, the number inserted within brackets after the name of an animal indicates the number of such animal in the Royal Dublin Society's Herd Book. A number without brackets indicates that the animal is registered in the English Dexter Herd Book.

Class 231.—*Dexter Bulls, born in or before* 1934.

1910 **I. & Champion.**[2]—COMTESSE ELIZABETH DE PRET ROOSE, Ellens, Rudgwick, Sussex, for **Grinstead Waterman,** born Feb. 25, 1934, bred by Lady Loder, Leonardslee, Horsham; *s.* Ratcliffe Negro's Manager 1096, *d.* Grinstead Watercress 3rd 3978 *by* Grinstead Fred 926.

1917 II.—CAPT. JOHN R. SLATTER, Castle Morton, Malvern, for **Castle Morton Apollo,** born May 29, 1934; *s.* Castle Morton Juniper 1133, *d.* Oakridge Bud 4519 *by* Oakridge Bramble 1051.

1914 III.—MRS. HUMPHREY R. PELLY, Lyndsays Farm, Ingatestone, Essex, for **Lyndsays Milky Way 2nd** 1179, born March 31, 1934; *s.* Lyndsays Milky Way 1090, *d.* Lyndsays Just Found 2nd 4510 *by* Wealden Boy Blue 1123.

1913 R.N.—THE REV. E. A. DOUGLAS MORGAN, Trefonen Rectory, Oswestry, for **Grinstead Nigger Boy.**

Class 232.—*Dexter Bulls, born in* 1935.

1922 I.—MRS. HUMPHREY R. PELLY, Lyndsays Farm, Ingatestone, Essex, for **Lyndsays Bridegroom** 1204, born April 1; *s.* Lyndsays Milky Way 1090, *d.* Treasure of Lyndsays 4620 *by* Wealden Page 1079.

1919 II.—HARRIETT GEE, Curragheen, Chew Magna, Bristol, for **Chew Tiny Tim,** born March 5, bred by Mrs. Brightric Gee; *s.* Grinstead Nigger Lad 1154, *d.* Chew Ruth 4578 *by* Banwell Peter 1081.

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[1] Silver Challenge Cup given by the British Kerry Cattle Society for the best Kerry.

[2] Silver Challenge Cup given by the Dexter Cattle Society for the best Dexter.

1918 III.—Comtesse Elizabeth de Pret Roose, Ellens, Rudgwick, Sussex, for **Ellens Gettysburg**, born May 5; *s.* Ratcliffe Negro's Manager 1096, *d.* Bagendon Gap 4356 *by* Woodland Gadfly 984.

1921 R.N.—The Rev. E. A. Douglas Morgan, Trefonen Rectory, Oswestry, for **Trefonen Jasper.**

Class 233.—*Dexter Cows, in-milk, any age.*

1927 I. & R.N. for Champion.[1]—Lady Loder, Leonardslee, Horsham, for **Grinstead Lavender 4th 4308**, born May 22, 1930, calved April 20, 1936; *s.* Grinstead Halfpenny 958, *d.* Grinstead Lavender 2nd 3809 *by* Oakridge Berry 931.

1926 II.—Mrs. Ernest Johnson, Ashton Hayes, Chester, for **Ashtonhayes Creina 4543**, born May 20, 1932, calved May 17, 1936; *s.* Grinstead Taxi 1089, *d.* Grinstead Convolvulus 3458 *by* Brokenhurst Penny 2nd 694.

1924 III.—Mrs. C. M. L. Calvert, Banwell Castle, Banwell, Somerset, for **Wishbone of Exmoor 4159**, red, born Jan. 28, 1927, calved April 30, 1936, bred by the Rev. W. W. Joyce, Charles Rectory, Barnstaple; *s.* Havering Bob Orange 885, *d.* Merrythought 3332 *by* Charlemagne 604.

1928 R.N.—Mrs. Humphrey R. Pelly, Lyndsays Farm, Ingatestone, Essex, for **Lyndsays Just Found 2nd.**
H.C.—1929. C.—1930.

Class 234.—*Dexter Heifers, in-milk to first calving, born in* 1933 *or* 1934.

1932 I.—Mrs. Ernest Johnson, Ashton Hayes, Chester, for **Ashtonhayes Watercress 4711**, born May 28, 1934, calved May 23, 1936; *s.* Grinstead Taxi 1089, *d.* Grinstead Watercress 2774 *by* Hever Tim 636.

1936 II.—Mrs. Humphrey R. Pelly, Lyndsays Farm, Ingatestone, Essex, for **Lyndsays Turquoise 4609**, born Aug. 25, 1933, calved May 3, 1936; *s.* Lyndsays Milky Way 1090, *d.* Tortoise Shell of Lyndsays 4452 *by* Bagendon Spear 990.

1937 III.—Mrs. T. H. Peyton, Colomendy, Mold, for **Colomendy Mary 4th 4660**, red, born June 4, 1934, calved May 17, 1936; *s.* Ratcliffe Dairyman 1076, *d.* Colomendy Mary 3787 *by* Oakridge Sentry 796.

1931 R.N.—Mrs. C. M. L. Calvert, Banwell Castle, Banwell, Somerset, for **Banwell Evangeline 5th.**
H.C.—1934. C.—1935.

Class 235.—*Dexter Heifers, born in* 1935.[2]

1941 I.—Comtesse Elizabeth de Pret Roose, Ellens, Rudgwick, Sussex, for **Ellens Cowslip**, born April 11; *s.* Grinstead Dairyman 1151, *d.* Grinstead Convolvulus 6th 4590 *by* Ratcliffe Negro's Manager 1096.

1942 II.—Comtesse Elizabeth de Pret Roose, for **Ellens Pottie**, born Jan. 26; *s.* Benendon Buttonhole 1103, *d.* Ratcliffe Partridge 4022 *by* Frensham Forester 1008.

1949 III.—Mrs. T. H. Peyton, Colomendy, Mold, for **Colomendy Gay 4th 4744**, born April 19; *s.* Ratcliffe Dairyman 1076, *d.* Colomendy Gay 4187 *by* Grinstead Tony 841.

1947 IV.—Mrs. Humphrey R. Pelly, Lyndsays Farm, Ingatestone, Essex, for **Lyndsays Broomstick 4771**, born April 9; *s.* Oakridge Simple Simon 1072, *d.* The Witch 4029 *by* Brockenhurst Phil 821.

1943 R.N.—Mrs. Ernest Johnson, Ashton Hayes, Chester, for **Ashtonhayes Creina 3rd.**
H.C.—1946. C.—1944.

Milk Yield Classes.

Class 236.—*Dairy Shorthorn Cows or Heifers.*

1146 I.—John Day, for **Huxham Duchess Rose 7th.** (See Class 167.)

1128 II.—Capt. T. Allen-Stevens, Wicklesham Lodge, Faringdon, for **104565 Silverstream Melody**, red and little white, born March 26, 1928, calved May 28, 1936, bred by J. Bailey, Hullbrook, Shamley Green, Guildford; *s.* Thornby Governor 211996, *d.* 56712 Snowford Musical *by* Woolmers Waterloo 177536.

1136 III.—Robert N. Tory, Anderson, Blandford, for **95885 Bladen Kirklevington**, red, born Oct. 27, 1927, calved March 28, 1936, bred by Sir E. R. Debenham, Bart., Bladen, Briantspuddle, Dorset; *s.* Sorbrook Don 202952, *d.* 62701 Kirklevington Mistress 2nd *by* Silver Star 185138.

1163 R.N.—G. H. Willis, for **Millbeck Benedict's Lucy 2nd.** (See Class 167.)
H.C.—1148, 1161.

Class 237.—*Lincolnshire Red Shorthorn Cows or Heifers.*

1238 I.—The Scothern Dairy Co., for **Lobthorpe Princess.** (See Class 173.)
1240 II.—Russell Wood, for **Bendish Cherry 37th.** (See Class 173.)
1241 III.—John Evens & Son, for **Burton Red Rose 10th.** (See Class 174.)

1236 R.N.—John Evens & Son, for **Burton Ruby Spot 32nd.**

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[1] Silver Challenge Cup given by the Dexter Cattle Society for the Best Dexter.
[2] Prizes, except Fourth, given by the Dexter Cattle Society.

Class 238.—*South Devon Cows or Heifers.*

[No Entries.]

Class 239.—*Red Poll Cows or Heifers.*

1373 I.—N. A. Heywood, for **Glevering Siskin.** (See Class 187.)

1358 II.—Stuart Paul, Kirton Lodge, Ipswich, for **32945 Model Victoria**, born Oct. 6, 1923, calved June 8, 1936, bred by A. B. Longe, Pettistree Grange, Wickham Market; *s.* Combs Heroic 11913, *d.* 26963 Henham Victoria *by* Manor Ash 11033.

1357 III.—Stuart Paul, for **41651 Kirton Gretchen**, born Aug. 23, 1928, calved June 1, 1936; *s.* Bredfield Pedlar 2nd 13313, *d.* 32728 Kirton Gaiety *by* Sudbourne Forerunner 11491.

Class 240.—*Blue Albion Cows or Heifers.*

1423 I.—Charles Henry Webster, for **Ivonbrook Fancy.** (See Class 192.

1421 II.—W. E. Glover, for **Mount Crocus 3rd.** (See Class 192.)

Class 241.—*British Friesian Cows or Heifers.*

1491 I.—Mrs. P. Tory, for **Holyport Arline.** (See Class 201.)

Class 242.—*Ayrshire Cows or Heifers.*

1570 I.—University of Edinburgh (Institute of Animal Genetics), Shothead, Balerno, Midlothian, for **Linnhead Olive 7th 35677**, born Jan. 29, 1931, calved June 7, 1936, bred by R. & W. Wallace, Linnhead, Sandilands, Lanark; *s.* Harleyholm Gay Boy 27940, *d.* Linnhead Olive 92482 *by* Finlaysont Radiant 18754.

1576 II.—J. R. P. Hedley, Southcote Grange Farm, Reading, for **Chapelhill Yvonne App-B. 6849**, born in Jan. 1928, calved May 15, 1936, bred by A. & J. Kerr, Knockshinnoch, New Cumnock; *s.* Knockshinnoch Laddie 28636.

1568 III.—University of Edinburgh (Institute of Animal Genetics), for **Auchenbrain Miss Craig 67th 33760**, born March 4, 1930, calved May 30, 1936, bred by David Wallace, Auchenbrain, Mauchline; *s.* Lyonston Douglas 25768, *d.* Auchenbrain Miss Craig 41st 9876 *by* Auchenbrain Sir George 24029.

1563 R.N.—Alexander Cochrane, Nether Craig, Kilmarnock, for **Drumfork Babs.**
H.C.—1579.

Class 243.—*Guernsey Cows or Heifers.*

1701 I.—Lord Swaythling, Townhill Park, West End, Southampton, for **38929 Bladen Gay Lass 2nd**, born May 15, 1932, calved Jan. 31, 1936, bred by Sir Ernest Debenham, Bart., Bladen, Briantspuddle, Dorset; *s.* Milton Rose Lad 7330, *d.* 14828 Tregothnan Gay Lass *by* Nicolle's Fleurie Sequel 3378.

1688 II.—Carl Holmes, for **Dairy Queen 3rd of Clover Top.** (See Class 217.)

1678 III.—H. H. Scott, Hartwell, Hartfield, Sussex, for **36440 Rose of Goodnestone 15th**, born Jan. 24, 1931, calved April 9, 1936, bred by Lord Fitzwalter, Goodnestone Park, Canterbury; *s.* Rose Bowl of Goodnestone 6539, *d.* 20537 Rose of Goodnestone 9th *by* Sequel's Slogan 2nd 4311.

1671 IV.—Mrs. E. Mansfield, Haberfield Hall, Easton-in-Gordano, Somerset, for **31478 Tyndall Park Nellie's Sequence 2nd**, born June 15, 1929, calved March 30, 1936; *s.* Tyndall Park Golden Arch 6578, *d.* 25136 Tyndall Park Nellie's Sequence *by* Nellie's Emblem 4433 P.S.

1665 R.N.—Carl Holmes, for **Dairy Queen 2nd of Clover Top.**
H.C.—1662, 1676, 1677, 1689.

Class 244.—*Jersey Cows or Heifers.*

1804 I.—S. S. Lockwood, Normanby Hill Dairy, Sinnington, York, for **14009 Normanby Chloe**, born April 3, 1931, calved April 23, 1936; *s.* Spring Time 16089, *d.* Kingsclere Claudette *by* Steyne Marshall Sage 16093.

1806 II.—James W. McCallum, Grange Farm, Chartridge, Chesham, for **14138 Pearcelands Eileen 10th**, born July 2, 1931, calved March 29, 1936, bred by the Pearcelands Jersey Herd and Dairies, Ltd., Stammerham, Sussex; *s.* Henbury Rising Star 17188, *d.* Pearcelands Boy's Eileen 9th *by* Ocean Boy 15891.

1793 III.—Grosvenor Berry, Mount Bures, Bures, Essex, for **11289 May Day**, born May 1, 1928, calved Dec. 27, 1935; *s.* Ella's Postboy, *d.* Wellesbourne Violin *by* Black Art.

1795 IV.—Mrs. G. J. Caddey, Manor House, Egham, Surrey, for **24581 Cambraie Elfa 2nd**, born Nov. 10, 1930, calved June 5, 1936, bred by H. A. Pallot, Jersey; *s.* Beauty's Observer (6429), *d.* (37487) Elfa's Rosie *by* Estella's Volunteer (6102).

1792 V.—Grosvenor Berry, for **12794 Easter Dinah**, born April 8, 1931, calved Feb. 22, 1936; *s.* Starting Post 16192, *d.* Winter Dinah *by* Nimrod.

1823 R.N.—The Ladies Constance Ryder and Audrey Anson, Knowle, Dunster, Somerset, for **Maid o' the Moor.**
H.C.—1790, 1791, 1798, 1799, 1801, 1807, 1808, 1809, 1810, 1819, 1820, 1822, 1824, 1831, 1864.

Class 245.—*Kerry Cows or Heifers.*

1899 I. & Champion.[1]—LT.-COL. J. A. INNES, D.S.O., for Ard Caein Doe. (See Class 229.)

1903 II. & R.N. for Champion.[1]—BERTRAM W. A. WATNEY, for Brookwood Anne. (See Class 229.)

1902 III.—NEWTON R. STEEL, for Hookland Angela. (See Class 229.)

1900 R.N.—THE KERRY COW DAIRY FARMS, Layer-de-la-Haye, Colchester, for Drumgaunagh Eliza.

Class 246.—*Dexter Cows or Heifers.*

1930 I. & Champion.[2]—CAPT. JOHN R. STATTER, Castle Morton, Malvern, for Oakridge Bud 4519, born April 18, 1930, calved June 5, 1936, bred by the Rev. R. Lingard Simkin, Durbridge, Redmarley, Glos.; *s.* Oakridge Bramble 1051, *d.* Marston Bud 2530 *by* Red Ensign 576.

1925 II. & R.N. for Champion.[1]—COMTESSE ELIZABETH DE PRET ROOSE, Ellens, Rudgwick, Sussex, for Ratcliffe Partridge 4022, born Sept. 1, 1927, calved March 18, 1936, bred by W. Lindsay Everard, Ratcliffe, Leics.; *s.* Frensham Forester 1008, *d.* Fillongley Forest Floret 3142 *by* Fillongley Forester 630.

1924 III.—MRS. C. M. L. CALVERT, for Wishbone of Exmoor. (See Class 233.)

1927 R.N.—LADY LODER, for Grinstead Lavender 4th. (See Class 233.)

Butter Tests.

Class 247.—*Cows of the Guernsey, Jersey, Kerry or Dexter Breeds.*

1797 I., Champion[3] & G.M.[4]—G. E. FLAMANK, Dibdens, Backwell, West Town, Somerset, for 15144 Beauvoir Harmony, born Aug. 27, 1929, calved Sept. 27, 1935, bred by J. J. Le Boutillier, St. Brelade, Jersey; *s.* Viscount of Oaklands 16688, *d.* 37303 L'Harmonie Pioneeress *by* Pioneer of Oaklands 16058.

1804 II., R.N. for Champion[3] & S.M.[4]—S. S. LOCKWOOD, for Normanby Chloe. (See Class 244.)

1688 III.—CARL HOLMES, for Dairy Queen 3rd of Clover Top. (See Class 217.)

1793 IV. & B.M[4].—GROSVENOR BERRY, for May Day. (See Class 244.)

1806 V.—JAMES W. MCCALLUM, for Pearcelands Eileen 10th. (See Class 244.)

1823 R.N.—THE LADIES CONSTANCE RYDER and AUDREY ANSON, Knowle, Dunster, Somerset, for Maid o' the Moor.

H.C.—1665, 1671, 1678, 1791, 1792, 1795, 1799, 1801, 1805, 1810, 1820.

Certificates of Merit.[5]—1791, 1792, 1795, 1799, 1801, 1805, 1810, 1820, 1823.

Certificates of Merit.[6]—1665, 1671, 1678.

Class 248.—*Cows of any other Breed.*

1421 I.—W. E. GLOVER, for Mount Crocus 3rd. (See Class 192.)

GOATS.[7]

The Prizes in each Class for Goats are: First Prize, £5; Second Prize, £3; Third Prize, £2; Fourth Prize, £1; Fifth Prize, 10s.

Class 249.—*Female Goats, in-milk, any age, entered in or eligible for the Toggenburg Section of the Herd Book.*

1952 I. & Champion.[8]—MISS ALEXANDER, Byards Lodge, Knaresborough, for Stockwell Calsie 732, born Jan. 1, 1932, kidded Feb. 27, 1936; *s.* Murrayston Hal 675, *d.* Stockwell Corella 658 *by* Sandhill Monday 553.

1953 II.—MISS ALEXANDER, for Stockwell Chorist 780, born Nov. 25, 1933, kidded Feb. 21, 1936; *s.* Stockwell Christopher 761, *d.* Stockwell Corinne 670 *by* Leazes Prince Hal 643.

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[1] The "Elmhurst" Perpetual Silver Challenge Cup given by the British Kerry Cattle Society for the Kerry Cow in Class 245 gaining the highest number of points.

[2] Perpetual Silver Challenge Cup given by the Dexter Cattle Society for the Dexter Cow in Class 246 gaining the highest number of points.

[3] Champion Gold Medal given for the Cow obtaining the highest number of points.

[4] Gold Medal (or £10 in money), Silver Medal and Bronze Medal given by the English Jersey Cattle Society for the three Jersey Cows obtaining the greatest number of points in the Butter Tests.

[5] Certificates of Merit given by the English Jersey Cattle Society for Jersey Cows, not being Prize Winners, obtaining the following points: Cows four years old and under, 36; Cows over four years old, 41.

[6] Certificates of Merit given by the English Guernsey Cattle Society for Guernsey Cows, not being Prize Winners, obtaining the following points: Cows four years old and under, 36; Cows over four years old, 41.

[7] £30 towards these prizes was given by the British Goat Society, and all the Challenge Certificates, Medals and Cups enumerated below and on pages xc to xcii, were given by the British Goat Society.

[8] Breed Challenge Certificate for the best Toggenburg Female Goat, over 2 years old.

Class 250.—*Female Goats, in-milk, any age, entered in or eligible fo the Saanen Section of the Herd Book.*

1954 II.—MISS E. SKIDMORE, Ashley Leigh, Box, Wilts., for **Heddon Buttercup** 202, born March 4, 1932, kidded March 4, 1936; *s.* Springfield Luke 121, *d.* Broxbourne Barbara 100 *by* Broxbourne Gold 62.

Class 251.—*Female Goats, in-milk, any age, entered in or eligible for the British Saanen Section or Register of the Herd Book.*

1964 **I. & Champion,[1] R.N. for Champion[2] & R.N. for Champion.[3]**—MISS POPE, Bashley Lodge, New Milton, Hants., for **Heddon Slipper** 278, born April 13, 1930, kidded Feb. 27, 1936, bred by Miss Skidmore, Ashley Leigh, Box; *s.* Springfield Luke 121, *d.* Heddon Saltcellar 7446 *by* Peter of Bushley 4207.

1960 **II. & R.N. for Champion.[1]**—MISS M. WINDOW HARRISON, Yewtree Farm, North Weald, Essex, for **Hartye of Weald** 1049, born April 30, 1933, kidded March 3, 1936; *s.* Theydon Mark 305, *d.* Haste of Weald 1046 *by* Didgemere Sidney 115.

1969 III.—MISS V. WALTON, East Ashling, Chichester, for **April Moonstone** 1106, born April 30, 1933, kidded March 27, 1936; *s.* Springfield Luke 121, *d.* Dissington Marcella 308 *by* Ridgeway Rumli 8711.

1961 IV.—MISS M. WINDOW HARRISON, for **Haste of Weald** 1046, born March 15, 1931, kidded April 12, 1936; *s.* Didgemere Sidney 115, *d.* Happy of Weald 1044 *by* Ridgeway Ruric 112.

1963 V.—MRS. MORCOM, Clock House, Bromsgrove, for **Cornish Urchinette** 1193, born March 18, 1934, kidded April 10, 1936; *s.* Springfield Ulick 1074, *d.* Cornish Roguette 467 *by* Cornish Regard 9427.

1959 R.N.—EDWARD T. HARDING, Dundas House, Stockwood Hill, Keynsham, Somerset, for **Heddon Springtide.**
H.C.—1967. C.—1962.

Class 252.—*Female Goats, in-milk, any age, entered in or eligible for the British Alpine Section or Register of the Herd Book.*

1974 **I., Champion,[2] Champion[3] & Champion.[4]**—MRS. ARTHUR ABBEY, Downe Hall, Roydon, Essex, for **Didgemere Dreamy** 1004, born Feb. 23, 1933, kidded March 21, 1935; *s.* Didgemere Actor 1027, *d.* Didgemere Dhortense 8211 *by* Leazes Kicksy Wicksy 67.

1971 **II. & R.N. for Champion.[4]**—MRS. ARTHUR ABBEY, for **Didgemere Darkaline** 349, born Feb. 19, 1932, kidded Feb. 18, 1936; *s.* Didgemere Angus 7161, *d.* Didgemere Dark 42 *by* Didgemere Duncan 5556.

1972 III.—MRS. ARTHUR ABBEY, for **Didgemere Delicious** 282, born April 12, 1934, kidded April 9, 1936; *s.* Didgemere Angus 7161, *d.* Didgemere Delectable 143 *by* Didgemere Dago 66.

1973 R.N.—MRS. ARTHUR ABBEY, for **Didgemere Dessica.**
H.C.—1975. C.—1977.

Class 253.—*Female Goats, in-milk, any age, entered in or eligible for the Anglo-Nubian Section of the Herd Book.*

1979 **I. & Champion.[5]**—J. R. EGERTON, Tye House, Bramford, Ipswich, for **Malpas Merry** 2309, born Feb. 4, 1934, kidded April 7, 1936; *s.* Garrochty Gaiters 2181, *d.* Malpas Merilees 2147 *by* Hoveton Freckle 1873.

1980 **II. & R.N. for Champion.[5]**—J. R. EGERTON, for **Malpas Mimoya** 2312, born Jan. 30, 1934, kidded March 16, 1936; *s.* Garrochty Gaiters 2181, *d.* Malpas Magnolia 13 *by* Hoveton Friar 1874.

1981 III.—MISS K. PELLY, Theydon Place, Epping, for **Ardoch Alackaday** 2237, born April 5, 1933, kidded May 24, 1936, bred by Miss Coskery, Ardoch, Cornwall; *s.* Etherley Fennel 2149, *d.* Ardoch Sheila 1 *by* Theydon Admiral 1765.

1983 R.N.—MISS E. SKIDMORE, Ashley Leigh, Box, Wilts., for **Moorhen.**

Class 254.—*Female Goats, in-milk, any age, any other variety.*

1990 I.—MRS. MORCOM, Clock House, Bromsgrove, for **Cornish Plaudit** 162, British Toggenburg, born Feb. 28, 1932, kidded March 5, 1935; *s.* Pleaser of Bashley 9571, *d.* Cornish Renown 9428 *by* Ridgeway Rumpelstiltskin 6536.

1991 II.—MRS. MORCOM, for **Cornish Playful** 11121, British, born Feb. 21, 1933, kidded April 11, 1936; *s.* Pleaser of Bashley 9571, *d.* Cornish Sanssouci 9940 *by* Fryston Sansovino 567.

1987 III.—MISS GRESLEY HALL, Chestnut Tree House, Willersey, Broadway, Worcs., for **Webb Demeter** 158, British Toggenburg, born March 19, 1933, kidded March 3, 1936; *s.* Didgemere Dauphin 10209, *d.* Webb Donetta 9565 *by* Pytchley Crispin 78.

1992 R.N.—MRS. MORCOM, for **Cornish Saccharine.**
H.C.—1985. C.—1989.

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[1] Breed Challenge Certificate for the best British Saanen Female Goat, over 2 years old.
[2] Challenge Certificate for the best Female Goat, over 2 years old, that has borne a kid.
[3] Bronze Medal for the best Female Goat.
[4] Breed Challenge Certificate for the best British Alpine Female Goat, over 2 years old.
[5] Breed Challenge Certificate for the best Anglo-Nubian Female Goat, over 2 years old.

Class 255.—*Goatlings, over* 1 *but not exceeding* 2 *years old, entered in or eligible for the Saanen Section or the British Saanen Section or Register of the Herd Book.*

2001 I.—Miss V. Walton, East Ashling, Chichester, for **April Moonlight 1108**, British Saanen, born March 31, 1935; *s.* Springfield Lavalle 144, *d.* April Moonstone 1106 *by* Springfield Luke 121.

2000 II.—Miss V. Walton, for **April Fairyqueen 1109**, British Saanen, born April 12, 1935; *s.* Springfield Santoi 243, *d.* Feltham Fairy 203 *by* Playwright of Bashley 8035.

1994 III.—J. R. Egerton, Tye House, Bramford, Ipswich, for **Malpas Merciful 543**, British Saanen, born March 15, 1935; *s.* Didgemere Actor 85, *d.* Malpas Mirth 10923 *by* Springfield Man 221.

1996 R.N.—Miss Pope, Bashley Lodge, New Milton, Hants., for **Heddon Silver.**

H.C.—1998. C.—1995.

Class 256.—*Goatlings, over* 1 *but not exceeding* 2 *years old, entered in or eligible for the British Alpine Section or Register of the Herd Book.*

2005 **I. & Champion.**[1]—Miss Pope, Bashley Lodge, New Milton, Hants., for **Highland Mauviette 486**, born March 2, 1935, bred by Mrs. Marshall, Owermoigne Moor, Dorchester; *s.* Didgemere Daredevil 1031, *d.* Highland Alouette 11171 *by* Didgemere Dean 178.

2003 II.—J. R. Egerton, Tye House, Bramford, Ipswich, for **Malpas Maidencrest 1060**, born Feb. 22, 1935; *s.* Malpas Match 360, *d.* Leazes Dencrest 11 *by* Didgemere Dennis 5487.

2004 III.—Miss Gresley Hall, Chestnut Tree House, Willersey, Broadway, Worcs., for **Webb Lestella 399**, born March 3, 1935; *s.* Didgemere Dioclesian 1029, *d.* Webb Larkspur 10202 *by* Pastor of Bashley 8034.

2002 R.N.—Miss C. Chamberlain, Westons, Lyndhurst, Hants., for **Whinchat of Westons.**

H.C.—2006.

Class 257.—*Goatlings, over* 1 *but not exceeding* 2 *years old, entered in or eligible for the Anglo-Nubian Section of the Herd Book.*

2008 I.—J. R. Egerton, Tye House, Bramford, Ipswich, for **Malpas Mindful 2403**, born March 2, 1935; *s.* Malpas Minstrel 2227, *d.* Hoveton Frivolity 2074 *by* Hoveton Borage 1930.

2011 II.—Miss K. Pelly, Theydon Place, Epping, for **Theydon Brita 2449**, born April 14, 1935; *s.* Cestrian Barney 2205, *d.* Theydon Banderol 2266 *by* Hoveton Freckle 1873.

2010 III.—Miss K. Pelly, for **Theydon Beroma 2448**, born April 14, 1935; *s.* Cestrian Barney 2205, *d.* Theydon Banderol 2266 *by* Hoveton Freckle 1873.

2009 R.N.—Mrs. M. E. T. Howden, Horstead, Coltishall, Norfolk, for **Buttermint of Coltishall.**

H.C.—2007.

Class 258.—*Goatlings, over* 1 *but not exceeding* 2 *years old, any other variety.*

2018 **I. & R.N. for Champion.**[1]—Mrs. Morcom, Clock House, Bromsgrove, for **Cornish Meltis 246**, British Toggenburg, born March 31, 1935; *s.* Marlais Merlin 84, *d.* Cornish Praline 161 *by* Pleaser of Bashley 9571.

2015 II.—Miss K. R. Barnaby, Abbey Mead, Hamble, Hants., for **Bitterne Willow 209**, British Toggenbury, born Feb. 12, 1935; *s.* Warden of Westons 10549, *d.* Bitterne Wish 10468 *by* Homestall David 9913.

2016 III.—Miss Gresley Hall, Chestnut Tree House, Willersey, Broadway, Worcs., for **Webb Daytona 212**, British Toggenburg, born March 8, 1935; *s.* Didgemere Dioclesian 1029, *d.* Webb Demeter 158 *by* Didgemere Dauphin 10209.

2019 R.N.—Miss Pope, Bashley Lodge, New Milton, Hants., for **Bitterne Flit.**

H.C.—2014. C.—2013.

Class 259.—*Milk Yield Class, Quality, open to animals entered in Classes* 249 *to* 254.

1992 I.—Mrs. Morcom, Clock House, Bromsgrove, for **Cornish Saccharine 10302**, British, born Feb. 22, 1931, kidded Jan. 29, 1936; *s.* Fryston Sansovino 567, *d.* Cornish Fondant 8882 *by* Cornish Quirk 6979.

1960 **II., Champion[2] & R.N. for Champion.**[3]—Miss M. Window Harrison, for **Hartye of Weald.** (See Class 251.)

1964 **III. & Champion.**[3]—Miss Pope, for **Heddon Slipper.** (See Class 251.)

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[1] Bronze Medal for the best Goatling.

[2] The "Chamberlain" Challenge Cup for the British Saanen Goat gaining the highest number of points in Inspection and Milking. The goat must be bred by exhibitor, entered in the British Saanen section or Register of the Herd Book, and have obtained an award in the Inspection Class.

[3] Challenge Certificate for the best Dual Purpose Goat, over 2 years old, that has borne a kid.

1987 **IV. & (with 2004) R.N. for Champion.**[1]—MISS GRESLEY HALL, for **Webb Demeter.** (See Class 254.)

1973 **V.**—MRS. ARTHUR ABBEY, Downe Hall, Roydon, Essex, for **Didgemere Dessica 278**, born March 11, 1934, kidded April 25, 1936 ; *s.* Didgemere Angus 7161, *d.* Didgemere Dessie 283 *by* Didgemere Dago 66.

1990 **R.N. & (with 2018) Champion.**[1]—MRS. MORCOM, for **Cornish Plaudit.** (See Class 254.)
1969 **R.N. for Champion.**[2]—MISS V. WALTON, for **April Moonstone.** (See Class 251.)
1979 **H.C. & Champion.**[3]—J. B. EGERTON, for **Malpas Merry.** (See Class 253.)
1981 **R.N. for Champion.**[3]—MISS K. PELLY, for **Ardoch Alackaday.** (See Class 253.)
1971 **Champion.**[4]—MRS. ARTHUR ABBEY, for **Didgemere Darkaline.** (See Class 252).
1974 **H.C. & R.N. for Champion.**[4]—MRS. ARTHUR ABBEY, for **Didgemere Dreamy.** (See Class 252.)

H.C.—1955, 1957, 1975, 1976, 1989.

Class 260.—*Milk Yield Class, Quantity, open to animals entered in Classes 249 to 254.*

1992 **I.**—MRS. MORCOM, for **Cornish Saccharine.** (See Class 254.)
1960 **II.**—MISS M. WINDOW HARRISON, for **Hartye of Weald.** (See Class 251.)
1987 **III.**—MISS GRESLEY HALL, for **Webb Demeter.** (See Class 254.)
1964 **IV.**—MISS POPE, for **Heddon Slipper.** (See Class 251.)
1991 **V.**—MRS. MORCOM, for **Cornish Playful.** (See Class 254.)

1961 **R.N.**—MISS M. WINDOW HARRISON, for **Haste of Weald.**

H.C.—1971, 1972, 1973, 1990. **C.**—1955, 1957, 1974, 1976, 1989.

SHEEP.

Unless otherwise stated, the Prizes in each Class for Sheep are : First Prize, £10 ; Second Prize, £5 ; Third Prize, £3 ; Fourth Prize, £2 ; Fifth Prize, £1.

Oxford Downs.

Class 261.—*Oxford Down Shearling Rams.*

2020 **I., Champion**[5] **& R.N. for Champion,**[6] 2021 **II.,** & 2023 **R.N.**—H. W. STILGOE, The Grounds, Adderbury, Banbury.
2025 **III.**—G. H. WILLIS, Birdlip, Glos.

H.C.—2022. **C.**—2024.

Class 262.—*Oxford Down Ram Lambs.*

2029 **I.,** & 2030 **R.N.**—E. G. CLIFFORD, Manley Farm, Quenington, Fairford, Glos.
2034 **II.,** & 2033 **IV.**—W. F. G. WATTS & SON, Elsfield, Oxford.
2031 **III.**—HOBBS & DAVIS, Kelmscott, Lechdale, Glos.

H.C.—2027, 2028. **C.**—2032, 2035.

Class 263.—*Three Oxford Down Ram Lambs.*

2040 **I. & R.N. for Champion.**[5]—W. F. G. WATTS & SON, Elsfield, Oxford.
2037 **II.**—E. G. CLIFFORD, Manley Farm, Quenington, Fairford, Glos.
2038 **III.**—HOBBS & DAVIS, Kelmscott, Lechlade, Glos.

2039 **R.N.**—H. W. STILGOE, The Grouuds, Adderbury, Banbury.
H.C.—2036, 2041. **C.**—2042.

Class 264.—*Three Oxford Down Shearling Ewes.*

2044 **I. & R.N. for Champion.**[7]—G. H. WILLIS, Birdlip, Glos.
2043 **II.**—H. W. STILGOE, The Grounds, Adderbury, Banbury.

Class 265.—*Three Oxford Down Ewe Lambs.*

2050 **I., Champion**[6] **& Champion,**[7] & 2051 **R.N.**—W. F. G. WATTS & SON, Elsfield, Oxford.
2046 **II.**—J. B. CHESTERMAN, Tuckwells Farm, Kempsford, Fairford, Glos.
2048 **III.**—HOBBS & DAVIS, Kelmscott, Lechlade, Glos.

H.C.—2045, 2047. **C.**—2049, 2052.

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[1] The "Dewar" Challenge Cup for the exhibitor showing a Female Goat in-milk, and a Goatling, under certain conditions.

[2] The "Chamberlain" Challenge Cup for the British Saanen Goat gaining the highest number of points in Inspection and Milking. The goat must be bred by the exhibitor, entered in the British Saanen section or Register of the Herd Book, and have obtained an award in the Inspection Class.

[3] The "Pomeroy" Challenge Cup for the Anglo-Nubian Goat, entered in the Anglo-Nubian section of the Society's Herd Book, gaining the highest number of points in the Quality Milking Class.

[4] The "Abbey" Challenge Cup for the British Alpine Goat gaining the highest number of points in Inspection and Milking. The goat must be bred by exhibitor, entered in the British Alpine section or Register of the Herd Book, and have obtained an award in its Inspection Class.

[5] The "Fernham" Silver Challenge Cup given through the Oxford Down Sheep Breeders' Association for the best Male exhibit.

[6] The "Birdlip" Silver Challenge Cup given through the Oxford Down Sheep Breeders' Association for the best exhibit.

[7] The "Kelmscott" Silver Challenge Plate given through the Oxford Down Sheep Breeders' Association for the best Female exhibit.

Shropshires.[1]

Class 266.—*Shropshire Shearling Rams.*

2062 I., R.N. for Champion[2] & R.N. for Champion.[3]—E. Craig Tanner, Eyton-on-Severn, Wroxeter, Shropshire.
2053 II.—John M. Belcher, Tibberton Green, Wellington, Shropshire.
2059 III. & 2060 R.N.—A. E. & W. Everall, Sherlowe, Wellington, Shropshire.
2061 IV.—Major J. N. Ritchie, Tern, Wellington, Shropshire.
H.C.—2054.

Class 267.—*Shropshire Ram Lambs.*

2065 I., Champion[2] & Champion.[3]—A. E. & W. Everall, Sherlowe, Wellington, Shropshire.
2066 II.—Major J. N. Ritchie, Tern, Wellington, Shropshire.
2064 III.—John M. Belcher, Tibberton Green, Wellington, Shropshire.
2067 R.N.—E. Craig Tanner, Eyton-on-Severn, Wroxeter, Shropshire.

Class 268.—*Three Shropshire Ram Lambs.*

2068 I.—John M. Belcher, Tibberton Green, Wellington, Shropshire.
2069 II.—A. E. & W. Everall, Sherlowe, Wellington, Shropshire.
2071 III.—E. Craig Tanner, Eyton-on-Severn, Wroxeter, Shropshire.

Class 269.—*Shropshire Shearling Ewes.*

2072 I.—John M. Belcher, Tibberton Green, Wellington, Shropshire.
2078 II., & 2077 III.—Major J. N. Ritchie, Tern, Wellington, Shropshire.
2079 R.N.—E. Craig Tanner, Eyton-on-Severn, Wroxeter, Shropshire.
H.C.—2076.

Class 270.—*Three Shropshire Ewe Lambs.*

2081 I.—A. E. & W. Everall, Sherlowe, Wellington, Shropshire.
2080 II.—John M. Belcher, Tibberton Green, Wellington, Shropshire.
2082 III.—Major J. N. Ritchie, Tern, Wellington, Shropshire.
2083 R.N.—E. Craig Tanner, Eyton-on-Severn, Wroxeter, Shropshire.

Southdowns.

Class 271.—*Southdown Two-Shear Rams.*

2085 I. & R.N. for Champion[4]—John Langmead & Son, Northwood, Ford, Arundel, for Flansham Dividend 23300.
2088 II.—Lady Ludlow, Luton Hoo, Luton, for Luton Hoo 541 of 1934.
2089 III.—J. Pierpont Morgan, Wall Hall, Aldenham, Watford, for Aldenham 159 of 1934.
2090 R.N.—J. Pierpont Morgan, for Aldenham 194 of 1934.
H.C.—2084. C.—2091.

Class 272.—*Southdown Shearling Rams.*

2103 I., Champion[4] & R.N. for Champion.[5]—Lady Ludlow, Luton Hoo, Luton.
2098 II.—John Langmead & Son, Northwood, Ford, Arundel.
2111 III.—William H. Pitts, Woodhorn, Oving, Chichester.
2108 IV. & 2107 V.—J. Pierpont Morgan, Wall Hall, Aldenham, Watford.
2113 R.N.—Mrs. V. G. Stride, Head Hone Farm, Lidsey, Bognor Regis.
H.C.—2101. C.—2092, 2099.

Class 273.—*Southdown Ram Lambs.*[6]

2129 I.—Mrs. V. G. Stride, Head Hone Farm, Lidsey, Bognor Regis.
2125 II.—William H. Pitts, Woodhorn, Oving, Chichester.
2116 III.—John Langmead & Son, Northwood, Ford, Arundel.
2123 IV.—J. Pierpont Morgan, Wall Hall, Aldenham, Watford.
2119 V.—Walter Langmead, Wicks Farm, Yapton, Arundel.
2118 R.N.—John H. Langmead, Flansham House, Flansham, Bognor Regis.
H.C.—2128. C.—2115, 2120.

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[1] £15 towards these Prizes were given by the Shropshire Sheep Breeders' Association.

[2] Champion Silver Medal given by the Shropshire Sheep Breeders' Association for the best Ram or Ram Lamb in Classes 266 and 267.

[3] The "Hardwicke" Perpetual Silver Challenge Cup given through the Shropshire Sheep Breeders' Association for the best exhibit.

[4] Champion Gold Medal, or £10 10*s.* in cash, given by the Southdown Sheep Society for the best Ram or Ram Lamb in Classes 271 to 273.

[5] The "Northumberland" Perpetual Silver Challenge Cup given through the Southdown Sheep Society for the best exhibit.

[6] Prizes, except Fourth and Fifth, given by the Southdown Sheep Society.

Class 274.—*Three Southdown Shearling Rams.*[1]

2136 I.—LADY LUDLOW, Luton Hoo, Luton.
2134 II.—JOHN LANGMEAD & SON, Northwood, Ford, Arundel.
2139 III.—WILLIAM H. PITTS, Woodhorn, Oving, Chichester.

2138 R.N.—HAROLD B. PAYNTER, Broadreed, Rowlands Castle, Hants.
H.C.—2131. C.—2132, 2140.

Class 275.—*Three Southdown Ram Lambs.*

2153 I.—WILLIAM H. PITTS, Woodhorn, Oving, Chichester.
2155 II.—MRS. V. G. STRIDE, Head Hone Farm, Lidsey, Bognor Regis.
2152 III.—J. PIERPONT MORGAN, Wall Hall, Aldenham, Watford.
2147 IV.—JOHN H. LANGMEAD, Flansham House, Flansham, Bognor Regis.
2145 V.—JOHN LANGMEAD & SON, Northwood, Ford, Arundel.

2148 R.N.—WALTER LANGMEAD, Wicks Farm, Yapton, Arundel.
H.C.—2143. C.—2144.

Class 276.—*Three Southdown Shearling Ewes.*

2156 I., **Champion**[2] **& Champion.**[3]—JOHN LANGMEAD & SON, Northwood, Ford, Arundel.
2161 II.—J. PIERPONT MORGAN, Wall Hall, Aldenham, Watford.
2164 III.—MRS. V. G. STRIDE, Head Hone Farm, Lidsey, Bognor Regis.

2158 R.N.—LADY LUDLOW, Luton Hoo, Luton.
H.C.—2160. C.—2162.

Class 277.—*Three Southdown Ewe Lambs.*

2167 **I. & R.N. for Champion.**[3]—JOHN LANGMEAD & SON, Northwood, Ford, Arundel.
2175 II.—WILLIAM H. PITTS, Woodhorn, Oving, Chichester.
2177 III.—MRS. V. G. STRIDE, Head Hone Farm, Lidsey, Bognor Regis.
2169 IV.—WALTER LANGMEAD, Wicks Farm, Yapton, Arundel.

2165 R.N.—THE EARL OF DERBY, K.G., Hatchfield Farm, Newmarket.
H.C.—2173. C.—2168.

Hampshire Downs.

Class 278.—*Hampshire Down Shearling Rams.*

2184 I.—G. M. HOPE, Basildon Home Farm, Pangbourne, Berks., for **Bestlesdune Centurion M.550.**
2178 II.—HENRY ARTHUR BENYON, Englefield House, Englefield, Reading, for **Englefield Felix M.479**, bred by the Exors. of James Flower, Chilmark, Salisbury.
2181 III., & 2180 R.N.—MAJOR V. S. BLAND, The Warren, Aldbourne, Wilts.
2185 IV.—P. C. TORY, Shapwick, Blandford.

Class 279.—*Hampshire Down Ram Lambs.*

2188 I.—HENRY ARTHUR BENYON, Englefield House, Englefield, Reading.
2189 II.—MAJOR V. S. BLAND, The Warren, Aldbourne, Wilts.
2195 III.—A. THOMAS LOYD, Lockinge House, Wantage.
2197 IV.—P. C. TORY, Shapwick, Blandford.

2191 R.N.—E. CLIFTON-BROWN, Burnham Grove, Burnham, Bucks.

Class 280.—*Three Hampshire Down Ram Lambs.*

2200 **I. & Champion.**[4]—MAJOR V. S. BLAND, The Warren, Aldbourne, Wilts.
2201 II.—E. CLIFTON-BROWN, Burnham Grove, Burnham, Bucks.
2204 III.—A. THOMAS LOYD, Lockinge House, Wantage.

2199 R.N.—HENRY ARTHUR BENYON, Englefield House, Englefield, Reading.

Class 281.—*Three Hampshire Down Shearling Ewes.*

2208 I., & 2207 II.—E. CLIFTON-BROWN, Burnham Grove, Burnham, Bucks.

Class 282.—*Three Hampshire Down Ewe Lambs.*

2209 **I. & R.N. for Champion.**[4]—HENRY ARTHUR BENYON, Englefield House, Englefield, Reading.
2211 II.—E. CLIFTON-BROWN, Burnham Grove, Burnham, Bucks.
2213 III.—A. THOMAS LOYD, Lockinge House, Wantage.

2214 R.N.—P. C. TORY, Shapwick, Blandford.

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[1] Prizes, except Fourth and Fifth, given by the Southdown Sheep Society.

[2] The "Northumberland" Perpetual Silver Challenge Cup given through the Southdown Sheep Society for the best exhibit.

[3] Champion Silver Medal, or £1 in cash, given by the Southdown Sheep Society for the best Pen of Ewes or Ewe Lambs.

[4] Champion Prize of £10 given by the Hampshire Down Sheep Breeders' Association for the best exhibit.

Suffolks.

Class 283.—*Suffolk Two-Shear Rams.*

2218 I.—John R. Keeble & Son, Brantham Hall, Manningtree, Essex, for **Brantham Walton Green 23824.**
2221 II.—Stuart Paul, Kirton Lodge, Ipswich, for **Kirton Stowmarket 24352.**
2223 III.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Carlton Fancy** 23501, bred by Capt. A. S. Cunningham Reid, Six Mile Bottom, Newmarket.
2220 R.N.—Stuart Paul, for **Kirton Second John.**
H.C.—2216.

Class 284.—*Suffolk Shearling Rams.*

2230 I., & 2229 III.—Stuart Paul, Kirton Lodge, Ipswich.
2227 II.—J. R. Keeble & Son, Brantham Hall, Manningtree, Essex.
2224 R.N.—The Earl of Ellesmere, Stetchworth Park, Newmarket.
H.C.—2228.

Class 285.—*Suffolk Ram Lambs.*

2240 I. & Champion[1], & 2239 IV.—J. R. Keeble & Son, Brantham Hall, Manningtree, Essex.
2237 II.—Hollesley Farm (L.C.C.), Hollesley, Woodbridge.
2244 III.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill.
2241 R.N.—Stuart Paul, Kirton Lodge, Ipswich.
H.C.—2236. C.—2238.

Class 286.—*Three Suffolk Ram Lambs.*[2]

2250 I. & R.N. for Champion.[1]—Hollesley Farm (L.C.C.), Hollesley, Woodbridge.
2256 II.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill.
2248 III.—G. A. Goodchild, Great Yeldham Hall, Great Yeldham, Essex.
2255 R.N.—Sir Prince Prince-Smith, Bart., Southburn, Driffield.
H.C.—2252. C.—2247.

Class 287.—*Three Suffolk Shearling Ewes.*

2261 I.—Stuart Paul, Kirton Lodge, Ipswich.
2262 II.—Sir Prince Prince-Smith, Bart., Southburn, Driffield.
2260 III.—J. R. Keeble & Son, Brantham Hall, Manningtree, Essex.
2259 R.N.—Hollesley Farm (L.C.C.), Hollesley, Woodbridge.
H.C.—2258.

Class 288.—*Three Suffolk Ewe Lambs.*

2268 I.—J. R. Keeble & Son, Brantham Hall, Manningtree, Essex.
2267 II.—Hollesley Farm (L.C.C.), Hollesley, Woodbridge.
2266 III.—G. A. Goodchild, Great Yeldham Hall, Great Yeldham, Essex.
2271 R.N.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill.
H.C.—2265. C.—2270.
Cup.[3]—J. R. Keeble & Son.
R.N. for Cup.[3]—Stuart Paul.

Dorset Downs.[4]

Class 289.—*Dorset Down Rams, Shearling and upwards.*

2272 I.—F. W. Surridge, Mucking, Stanford-le-Hope, Essex, for ram, born in 1935.

Class 290.—*Dorset Down Ram Lambs.*

2281 I.—F. W. Surridge, Mucking, Stanford-le-Hope, Essex.
2273 II., & 2274 R.N.—Hooper Bros., Newburgh, Winfrith, Dorchester.
2276 III.—R. R. Mead, Volis, Taunton.
H.C.—2280. C.—2278.

Class 291.—*Dorset Down Shearling Ewes.*

2283 I., & 2285 II.—F. W. Surridge, Mucking, Stanford-le-Hope, Essex.
2282 III.—John Strang, Bere Regis, Wareham.

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[1] Perpetual Challenge Plate and £5 in cash given by the Suffolk Sheep Society for the best exhibit.

[2] Prizes given by the Suffolk Sheep Society.

[3] The "Southburn" Silver Challenge Cup given through the Suffolk Sheep Society for the most points awarded in a combination of entries.

[4] £23 towards these prizes were given by the Dorset Down Sheep Breeders' Association.

Class 292.—*Dorset Down Ewe Lambs.*

2288 I., & 2289 II.—P. & C. SEWARD, Weston, Petersfield, Hants.
2287 III., & 2286 R.N.—HOOPER BROS., Newburgh, Winfrith, Dorchester.

Dorset Horns.

Class 293.—*Dorset Horn Ram Lambs, born on or after October* 1, 1935.[1]

2294 I. & R.N. for Champion,[2] 2296 II., & 2295 R.N.—W. RUPERT TORY, Clenstone Manor, Blandford.

2292 III.—REGINALD E. BENNETT, Eastfield Farm, Cheselbourne, Dorchester.

Class 294.—*Two Dorset Horn Shearling Ewes, born on or after October* 1, 1934.

2300 I., & 2301 II.—W. RUPERT TORY, Clenstone Manor, Blandford.
2299 III., & 2298 R.N.—CHARLES JOCELYN HAMBRO, Hedge End, Blandford.

Class 295.—*Two Dorset Horn Ewe Lambs, born on or after October* 1, 1935.

2308 I. & Champion,[2] 2307 II., & 2306 III.—W. RUPERT TORY, Clenstone Manor, Blandford.

2302 R.N.—REGINALD E. BENNETT, Eastfield Farm, Cheselbourne, Dorchester.
H.C.—2304.

Wiltshire Horns.

Class 296.—*Wiltshire Horn Rams, Two-Shear and upwards.*[3]

2312 I.—G. H. & E. R. MORRIS, Llwynymaen, Oswestry, for **Brockhall Ensign 3681**, born in 1934, bred by Brodie Bros., Brockhall, Northampton.
2310 II.—ALAN GOWLING, Grange Farm, Gaddesby, Leicestershire, for **Kislingbury Surprise 3868**, born in 1934, bred by P. L. Smith, Kislingbury Grange, Northampton.
2309 III.—H. ATTERBURY, Sharley Cop, Ravensthorpe, Northampton, for **Chymedd King 3768**, born in 1934, bred by J. H. Parry Jones, Cae Mawr, Llanerchymedd, Anglesey.

2311 R.N.—ALAN GOWLING, for **Snowford Sunbeam.**

Class 297.—*Wiltshire Horn Shearling Rams.*

2316 I.—G. H. & E. R. MORRIS, Llwynymaen, Oswestry, for **Llwynymaen Banker 4073.**
2315 II.—ALAN GOWLING, Grange Farm, Gaddesby, Leicestershire, for **Gubblecote Return 4165**, bred by W. B. Southernwood & Son, Gubblecote, Tring.
2314 III.—H. ATTERBURY, Sharley Cop, Ravensthorpe, Northampton, for **Sharley Mischief 3934.**

Class 298.—*Wiltshire Horn Shearling Ewes.*

2321 I. & Champion[4], & 2322 R.N.—P. L. SMITH, Kislingbury Grange, Northampton, for ewes bred by R. Mercy, Bowden Farm, Soulbury, Leighton Buzzard.
2317 II. & R.N. for Champion[4], & 2318 III.—G. H. & E. R. MORRIS, Llwynymaen, Oswestry.

Ryelands.

Class 299.—*Ryeland Rams, Two-Shear and upwards.*

2326 I.—DAVID J. THOMAS, Monachty, Abergavenny, for **Thomas's Realm 3262**, born in 1934.
2325 II.—T. W. MONTAGUE PERKINS, Ufton Court, Holme Lacy, Hereford, for **Holme Lacy Marshall**, born in 1934.
2324 III.—HENRY MOORE, Shucknall Court, Hereford, for **Priors Envoy 3159**, born in 1933, bred by H. N. Moore, Dormington Court, Hereford.
2323 R.N.—HENRY C. DENT, Eastwood, Tarrington, Hereford, for **Holme Lacy Murphy.**

Class 300.—*Ryeland Shearling Rams.*

2332 I. & Champion.[5]—DAVID J. THOMAS, Monachty, Abergavenny, for **Thomas's Signal.**
2327 II. & R.N. for Champion.[5]—T. W. MONTAGUE PERKINS, Ufton Court, Holme Lacy, Hereford, for **Holme Lacy Nevada.**
2328 III.—T. W. MONTAGUE PERKINS, for **Holme Lacy Nimbus.**
2329 R.N.—T. W. MONTAGUE PERKINS, for **Holme Lacy Nocturne.**
H.C.—2331. C.—2330.

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[1] Prizes given by the Dorset Horn Sheep Breeders' Association.

[2] Champion Prize of £5 given by the Dorset Horn Sheep Breeders' Association for the best exhibit.

[3] Prizes given by the Wiltshire Horn Sheep Society.

[4] The "Pytchley" Silver Challenge Cup given through the Wiltshire Horn Sheep Society for the best exhibit.

[5] Silver Challenge Cup given through the Ryeland Flock Book Society for the best Shearling Ram.

Class 301.—*Three Ryeland Ram Lambs.*

2336 I.—T. W. MONTAGUE PERKINS, Ufton Court, Holme Lacy, Hereford.
2334 II.—LORD CAWLEY, Berrington Hall, Leominster.
2338 III.—CAPT. D. M. WILLS, Barley Wood, Wrington, Somerset.

2337 R.N.—DAVID J. THOMAS, Monachty, Abergavenny.
H.C.—2335. C.—2333.

Class 302.—*Three Ryeland Shearling Ewes.*

2342 I.—DAVID J. THOMAS, Monachty, Abergavenny.
2341 II., & 2340 III.—T. W. MONTAGUE PERKINS, Ufton Court, Holme Lacy, Hereford.

Kerry Hills (Wales).

Class 303.—*Kerry Hill (Wales) Rams, Two-Shear and upwards.*

2348 I. & Champion.[1]—T. WILLIAMS, The Gaer, Forden, Welshpool, for **Kerry Goalkeeper** 18061, born in 1933, bred by Ben Alderson, Glanmiheli, Kerry, Montgomery.

2343 II. & R.N. for Champion.[1]—JOHN T. BEAVAN, Winsbury, Chirbury, Montgomery, for **Marlow Elector** 18739, born in 1934, bred by S. Owens, Marlow, Leintwardine, Hereford.

2347 III.—THE HON. MRS. ESME SMYTH, Ashton Court, Bristol, for **Gaer Peer** 18545, born in 1934, bred by T. Williams, The Gaer, Forden, Welshpool.

2346 R N.—J. W. OWENS, Woodhouse, Shobdon, Herefordshire, for **Marlow Energetic.**
C.—2344.

Class 304.—*Kerry Hill (Wales) Shearling Rams.*

2359 I.—T. WILLIAMS, The Gaer, Forden, Welshpool, for **Gaer Quality** 19132.
2350 II.—JOHN T. BEAVAN, Winsbury, Chirbury, Montgomery, for **Winsbury Record** 19489.
2352 III.—J. W. OWENS, Woodhouse, Shobdon, Herefordshire, for **Shelderton Active** 19373, bred by G. Makelin & Sons, Shelderton, Leintwardine.

2356 R.N.—THE DUKE OF WESTMINSTER, G.C.V.O., D.S.O., Eaton Home Farm, Aldford, Chester, for **Eaton Command.**
H.C.—2358. C.—2351.

Class 305.—*Kerry Hill (Wales) Ram Lambs.*

2362 I.—J. W. OWENS, Woodhouse, Shobdon, Herefordshire, for **Stockley Togo.**
2366 II.—THE DUKE OF WESTMINSTER, G.V.C.O., D.S.O., Eaton Home Farm, Aldford, Chester, for **Eaton Diadem.**
2360 III.—JOHN T. BEAVAN, Winsbury, Chirbury, Montgomery, for **Winsbury Songster.**

2367 R.N.—T. WILLIAMS, The Gaer, Fordon, Welshpool, for **Gaer Ripper.**
C.—2364.

Class 306.—*Three Kerry Hill (Wales) Shearling Ewes.*

2368 I.—JOHN T. BEAVAN, Winsbury, Chirbury, Montgomery.
2372 II.—THE HON. MRS. ESME SMYTH, Ashton Court, Bristol.
2370 III.—J. W. OWENS, Woodhouse, Shobdon, Herefordshire.

2369 R.N.—BROGYNTYN ESTATE COMPANY, Brogyntyn, Oswestry.
H.C.—2373.

Class 307.—*Three Kerry Hill (Wales) Ewe Lambs.*[2]

2376 I., & 2375 II.—JOHN T. BEAVAN, Winsbury, Chirbury, Montgomery.
2381 III.—THE DUKE OF WESTMINSTER, G.C.V.O., D.S.O., Eaton Home Farm, Alford, Chester.

2377 R.N.—BROGYNTYN ESTATE COMPANY, Brogyntyn, Oswestry.
H.C.—2382.

Clun Forest.

Class 308.—*Clun Forest Rams, Two-Shear and upwards.*

2384 I.—W. R. LYKE, Lawton Bury, Leominster, for **Glen Briton** 2404, born in 1932, bred by Miss E. A. Rossiter, Glen Alva, Ewyas Harold, Pontrilas.
2383 II.—T. E. GWILLIM, Ffostill, Talgarth, Brecon, for **Bedstone Kingfisher** 2850, born in 1934, bred by H. J. Marsh, Bedstone, Bucknell.
2385 III.—D. POWELL, Lower Kimbolton, Leominster, for **Kimbolton Eric** 3020, born in 1934.

2386 R.N.—MISS EILEEN A. L. ROSSITER, Glen Alva, Ewyas Harold, Pontrilas, Hereford, for **Glen Champion.**

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[1] Silver Challenge Cup given through the Kerry Hill (Wales) Flock Book Society for the best exhibit.

[2] Prizes given by the Kerry Hill (Wales) Flock Book Society.

Class 309.—*Clun Forest Shearling Rams.*

2388 I.—R. F. Mitchell Evans, Cholstrey Court, Leominster.
2390 II.—W. R. Lyke, Lawton Bury, Leominster, for **George 5th of Lawton Bury.**
2393 III.—Miss Eileen A. L. Rossiter, Glen Alva, Ewyas Harold, Pontrilas, Hereford, for **Ffostill Gem 5th,** bred by T. E. Gwillim, Ffostill, Talgarth, Brecon.
2392 R.N.—D. Powell, Lower Kimbolton, Leominster, for **Ffostill.**

Class 310.—*Clun Forest Ram Lambs.*

2396 I.—T. E. Gwillim, Ffostill, Talgarth, Brecon.
2394 II.—R. F. Mitchell Evans, Cholstrey Court, Leominster.
2397 III.—W. R. Lyke, Lawton Bury, Leominster.
2399 R.N.—D. Powell, Lower Kimbolton, Leominster.

Class 311.—*Clun Forest Shearling Ewes.*

2401 I.—T. E. Gwillim, Ffostill, Talgarth, Brecon.
2402 II., & 2403 III.—H. J. Marsh & Son, Bedstone, Bucknell, Shropshire.
2404 R.N.—D. Powell, Lower Kimbolton, Leominster.

Class 312.—*Clun Forest Ewe Lambs.*[1]

2406 I., & 2405 II.—R. F. Mitchell Evans, Cholstrey Court, Leominster.
2408 III.—W. R. Lyke, Lawton Bury, Leominster.
2407 R.N.—T. E. Gwillim, Ffostill, Talgarth, Brecon.

Lincolns.

Class 313.—*Lincoln Shearling Rams.*

2416 **I. & Champion.**[2]—Clifford Nicholson, Willoughton Manor, Lincoln.
2413 **II. & R.N. for Champion**[2], & 2412 R.N.—Ernest Addison, Riby Grange, Stallingborough, Lincs.
2414 III.—D. F. Browett, Thornton House, Thornton, Horncastle, Lincs.

Class 314.—*Three Lincoln Shearling Rams.*

2421 I.—Ernest Addison, Riby Grange, Stallingborough, Lincs.
2426 II.—H. J. Smith, Ling's Farm, Croxby, Caistor, Lincs.
2425 III.—Clifford Nicholson, Willoughton Manor, Lincoln.
2423 R.N.—D. F. Browett, Thornton House, Thornton, Horncastle, Lincs.

Class 315.—*Three Lincoln Ram Lambs.*

2428 I.—Ernest Addison, Riby Grange, Stallingborough, Lincs.
2430 II.—Clifford Nicholson, Willoughton Manor, Lincoln.
2431 III.—H. J. Smith, Ling's Farm, Croxby, Caistor, Lincs.

Class 316.—*Three Lincoln Ewe Lambs.*

2432 I.—Ernest Addison, Riby Grange, Stallingborough, Lincs.
2433 II.—Clifford Nicholson, Willoughton Manor, Lincoln.
2434 III.—H. J. Smith, Ling's Farm, Croxby, Caistor, Lincs.

Leicesters.

Class 317.—*Leicester Shearling Rams.*

2436 **I. & Champion,**[3] & 2437 III.—William Jordan, Eastburn, Driffield.
2438 **II. & R.N. for Champion,**[3] & 2439 R.N.—The Exors. of R. H. Stocks, Haywold, North Dalton, Driffield.
H.C.—2435.

Class 318.—*Leicester Ram Lambs.*

2441 I., & 2442 R.N.—William Jordan, Eastburn, Driffield.
2444 II., & 2443 III.—The Exors. of R. H. Stocks, Haywold, North Dalton, Driffield.
H.C.—2440.

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[1] Prizes given by the Clun Forest Sheep Breeders' Society.

[2] Special Prize of £5 given by the Lincoln Longwool Sheep Breeders' Association for the best Shearling Ram.

[3] Champion Prize of a Piece of Plate given by the Leicester Sheep Breeders' Association for the best exhibit.

Class 319.—*Leicester Shearling Ewes.*

2446 I., & 2447 R.N.—WILLIAM JORDAN, Eastburn, Driffield.
2445 II.—F. W. DENNIS, 43, Aberdeen Walk, Scarborough.
2448 III.—CHARLES H. SIMPSON, Castle House, Hunmanby, Filey.

Class 320.—*Leicester Ewe Lambs.*

2450 I., & 2451 R.N.—WILLIAM JORDAN, Eastburn, Driffield.
2449 II.—F. W. DENNIS, 43, Aberdeen Walk, Scarborough.
2452 III.—THE EXORS. OF R. H. STOCKS, Haywold, North Dalton, Driffield.

Border Leicesters.

Class 321.—*Border Leicester Rams, Two-Shear and upwards.*

2453 I.—COL. E. W. S. BALFOUR, D.S.O., O.B.E., M.C., Balbirnie, Markinch, Fife, for **Hatton's £100 10354**, born in 1933, bred by Alex. Findlay, Hatton, Newtyle, Angus.
2455 II.—DONALD CROSS, Knockdon, Maybole, for **Salaam 10484**, born in 1934, bred by Robert S. Forrest, Thornholme, Carluke.
2458 III.—ROBERT WILSON, Dockrayrigg, Wigton, for **Bogardo Miracle**, born in 1934, bred by James Findlay, Bogardo.

Class 322.—*Border Leicester Shearling Rams.*

2464 **I. & Champion.**[1]—DONALD CROSS, Knockdon, Maybole.
2460 **II. & R.N. for Champion**[1], & 2462 R.N.—R. C. CAMERON, Greenlawdean, Greenlaw, Berwickshire.
2463 III.—DONALD CROSS, for **Wexford 10933**, bred by James Taylor, High Wexford, Symington.

Class 323.—*Border Leicester Ewes, Two-Shear and upwards.*[2]

2468 I.—DONALD CROSS, Knockdon, Maybole.
2467 II.—COL. E. W. S. BALFOUR, D.S.O., O.B.E., M.C., Balbirnie, Markinch, Fife, for ewe, born in 1933, bred by John Fordyce, Silverford, Gamrie, Banff.
2469 III.—ROBERT WILSON, Dockrayrigg, Wigton, for ewe, bred by W. C. Moyes & Sons, Renmure, Inverkeilor.

Class 324.—*Border Leicester Shearling Ewes.*

2474 I.—DONALD CROSS, Knockdon, Maybole.
2471 II., & 2470 III.—COL. E. W. S. BALFOUR, D.S.O., O.B.E., M.C., Balbirnie, Markinch, Fife.
2472 R.N.—R. C. CAMERON, Greenlawdean, Greenlaw, Berwickshire.

Wensleydales.

Class 325.—*Wensleydale Rams, Two-Shear and upwards.*

2476 I.—JOHN DARGUE, Burneside Hall, Kendal, for **Burneside Proud Champion 4033**, born in 1933.
2477 II.—JOHN DARGUE, for ram, born in 1934, bred by T. B. Earle, Bolton Grange, Scorton, Yorks.
2478 III.—JOHN PERCIVAL, Easthouse, Carperby, Yorks., for **Easthouse Sensation**, born in 1934.

Class 326.—*Wensleydale Shearling Rams.*

2479 **I. & Champion.**[3]—JOHN DARGUE, Burneside Hall, Kendal.
2481 **II. & R.N. for Champion.**[3]—JOHN PERCIVAL, Easthouse, Carperby, Yorks.
2480 III.—JOHN DARGUE, for ram, bred by Frank Foster, Middleton Quernhow, Ripon.

Class 327.—*Three Wensleydale Shearling Rams.*

2482 I.—JOHN DARGUE, Burneside Hall, Kendal.
2483 II.—JOHN PERCIVAL, Easthouse, Carperby, Yorks., for rams, bred by John Hargrave, Wath, Ripon.

Class 328.—*Wensleydale Shearling Ewes.*

2484 I., & 2485 II.—JOHN DARGUE, Burneside Hall, Kendal, for ewes, bred by Hardcastle & Sons, Rigton Grange, East Keswick, Leeds.
2486 III.—JOHN PERCIVAL, Easthouse, Carperby, Yorks.

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[1] Perpetual Silver Challenge Cup and a Gold Medal given by the Society of Border Leicester Sheep Breeders for the best Ram or Ewe.

[2] Prizes given by the Society of Border Leicester Sheep Breeders.

[3] Silver Challenge Trophy and a Gold Medal to the Breeder given by the Wensleydale Longwool Sheep Breeders' Association for the best exhibit.

Class 329.—*Wensleydale Yearling Ewes shown in wool.*[1]

2488 I.—John Dargue, Burneside Hall, Kendal, for ewe, bred by John Hargrave, Wath, Ripon.
2491 II., & 2490 III.—John Percival, Easthouse, Carperby, Yorks.

Kent or Romney Marsh.

Class 330.—*Kent or Romney Marsh Two-Shear Rams.*

2493 I. & R.N. for Champion.[2]—Clifford Nicholson, Willoughton Manor, Lincoln, for Horkstow Manor No. 1 of 1934 79189.
2495 II.—J. Egerton Quested, The Firs, Cheriton, Kent, for Quested's 169 of 1934 78417.
2496 III.—J. Egerton Quested, for Quested's 339 of 1934 78498.
2492 R.N.—E. W. Baker, Parsonage Farm, Bekesbourne, Canterbury, for Baker's No. 76 f 1934.
C.—2494.

Class 331.—*Kent or Romney Marsh Shearling Rams.*

2507 I. & Champion,[2] & 2508 III.—Ashley Stevens, Davington Hall, Faversham, Kent.
2505 II., & 2506 IV.—J. Egerton Quested, The Firs, Cheriton, Kent.
2503 R.N.—Clifford Nicholson, Willoughton Manor, Lincoln.
H.C.—2500, 2502, 2504. C.—2501.

Class 332.—*Three Kent or Romney Marsh Shearling Rams.*[3]

2514 I. £20.—J. Egerton Quested, The Firs, Cheriton, Kent.
2517 II. £15.—Ashley Stevens, Davington Hall, Faversham, Kent.
2512 III. £10, & 2513 IV. £5.—Clifford Nicholson, Willoughton Manor, Lincoln.
2510 R.N.—P. Hickman, Pett Farm, Charing, Kent.
H.C.—2509, 2518. C.—2516.

Class 333.—*Three Kent or Romney Marsh Ram Lambs.*

2522 I.—J. Egerton Quested, The Firs, Cheriton, Kent.
2524 II.—Ashley Stevens, Davington Hall, Faversham, Kent.
2520 III.—Clifford Nicholson, Willoughton Manor, Lincoln.
2519 R.N.—P. Hickman, Pett Farm, Charing, Kent.
H.C.—2523.

Class 334.—*Three Kent or Romney Marsh Shearling Ewes.*

2528 I. & Champion[4], & 2530 III.—J. Egerton Quested, The Firs, Cheriton, Kent.
2531 II.—Ashley Stevens, Davington Hall, Faversham, Kent.
2527 R.N.—Clifford Nicholson, Willoughton Manor, Lincoln.
H.C.—2526. C.—2525.

Class 335.—*Three Kent or Romney Marsh Ewe Lambs.*

2532 I. & R.N. for Champion[4], & 2533 R.N.—Clifford Nicholson, Willoughton Manor, Lincoln.
2536 II.—Ashley Stevens, Davington Hall, Faversham, Kent.
2534 III.—J. Egerton Quested, The Firs, Cheriton, Kent.
H.C.—2535.

Devon Long-Wools.

Class 336.—*Devon Long-Wool Shearling Rams.*

2537 I.—Robert Lawrence, Rull, Cullompton.
2539 II.—M. H. Watts & Son, Knowle, Okehampton, Devon.
2538 III.—W. M. Snell, Orway, Kentisbeare, Cullompton, for Orway Favourite.

Class 337.—*Devon Long-Wool Ram Lambs.*

2542 I.—M. H. Watts & Son, Knowle, Okehampton, Devon.
2540 II.—Robert Lawrence, Rull, Cullompton.
2541 III.—W. M. Snell, Orway, Kentisbeare, Cullompton, for Orway Fancy.

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[1] Prizes given by the Wensleydale Longwool Sheep Breeders' Association.

[2] Champion Prize of £10 10s. given by the Kent or Romney Marsh Sheep Breeders' Association for the best Ram in Classes 330 and 331.

[3] Prizes given by the Kent or Romney Marsh Sheep Breeders' Association.

[4] Champion Prize of £10 10s. given by the Kent or Romney Marsh Sheep Breeders' Association for the best Pen of Ewes or Ewe Lambs.

Class 338.—*Devon Long-Wool Shearling Ewes.*

2543 I.—Robert Lawrence, Rull, Cullompton.
2545 II.—M. H. Watts & Son, Knowle, Okehampton, Devon.
2544 III.—W. M. Snell, Orway, Kentisbeare, Cullompton, for **Orway True Type.**

Devon Close-Wools.

Class 339.—*Devon Close-Wool Rams, Two-Shear and upwards.*

2547 I.—A. W. Friend & Sons, Brightlycott Barton, Barnstaple, for ram, born in 1933, bred by A. Parkhouse & Son, Holwell, East Down, Barnstaple.
2546 II.—F. W. Cook, Irishborough, Chittlehampton, Devon, for ram, born in 1933.
2549 III.—A. Parkhouse & Sons, Holwell, East Down, Barnstaple, for ram, born in 1934.

Class 340.—*Devon Close-Wool Shearling Rams.*

2552 I.—A. R. Lerwill, Maddox Down, East Down, Barnstaple.
2550 II.—F. W. Cook, Irishborough, Chittlehampton, Devon.
2553 III.—A. Parkhouse & Sons, Holwell, East Down, Barnstaple.

Class 341.—*Two Devon Close-Wool Shearling Ewes.*

2557 I.—A. Parkhouse & Sons, Holwell, East Down, Barnstaple.
2556 II.—A. R. Lerwill, Maddox Down, East Down, Barnstaple.
2555 III.—F. W. Cook, Irishborough, Chittlehampton, Devon.

South Devons.

Class 342.—*South Devon Shearling Rams.*

2561 I.—A. C. Lanyon, Coswarth, St. Columb, Cornwall.
2559 II.—W. F. R. Bice, Nanswhyden, St. Columb, Cornwall, for **Nanswhyden No. 12 25141,** bred by W. C. Bice & Son, St. Columb, Cornwall.
2558 III.—W. F. R. Bice, for **Nanswhyden No. 3 25132,** bred by W. C. Bice & Son, St. Columb, Cornwall.
2560 R.N.—J. N. Grose, Penare, Gorran, Cornwall.

Class 343.—*South Devon Ram Lambs.*

2563 I.—J. N. Grose, Penare, Gorran, Cornwall.
2564 II.—A. C. Lanyon, Coswarth, St. Columb, Cornwall.
2562 III.—W. F. R. Bice, Nanswhyden, St. Columb, Cornwall.

Class 344.—*South Devon Shearling Ewes, shown in wool.*

2565 I., & 2566 II.—J. N. Grose, Penare, Gorran, Cornwall.

Class 345.—*South Devon Ewe Lambs.*

2569 I.—A. C. Lanyon, Coswarth, St. Columb, Cornwall.
2568 II.—J. N. Grose, Penare, Gorran, Cornwall.
2567 III.—W. F. R. Bice, Nanswhyden, St. Columb, Cornwall.

Dartmoors.

Class 346.—*Dartmoor Rams, Shearling and upwards, shown out of wool.*

2570 I.—J. H. Cole, Chaddlehanger, Tavistock, for **Sherford No. 6 of 1934 5155,** born in 1934, bred by J. W. Symons, Sherford, Brixton, Devon.
2574 II.—Richard Palmer Luce, Lower Chaddlehanger, Tavistock, for **Polston No. 92 5142,** born in 1934, bred by E. W. Mead, Wellington House, South Brent.
2573 III.—Richard Palmer Luce, for **Chaddlehanger Marvel 5118,** born in 1935.
2571 R.N.—George Glanfield, West Lake, Okehampton, for **Bullhornstone No. 29.**
H.C.—2572.

Class 347.—*Dartmoor Ram Lambs, shown in wool.*

2578 I., & 2579 III.—Richard Palmer Luce, Lower Chaddlehanger, Tavistock.
2575 II.—J. H. Cole, Chaddlehanger, Tavistock.
2577 R.N.—Henry J. Kingwell, Great Aish, South Brent, for **Walreddon Lad.**
H.C.—2576.

Class 348.—*Dartmoor Shearling Ewes, shown in wool.*

2582 I.—J. H. Cole, Chaddlehanger, Tavistock.
2586 II.—Stephen Mead, Mount Pleasant, Murchington, Chagford, Newton Abbot.
2585 III.—Richard Palmer Luce, Lower Chaddlehanger, Tavistock.
H.C.—2581.

Class 349.—*Dartmoor Ewe Lambs, shown in wool.*

2590 I.—Richard Palmer Luce, Lower Chaddlehanger, Tavistock.
2587 II., & 2588 III.—J. H. Cole, Chaddlehanger, Tavistock.
H.C.—2591.

Exmoor Horn.

Classes 350 to 352.—*Cancelled under Regulation* 10.

Cheviot.

Classes 353 and 354.—*Cancelled under Regulation* 10.

Welsh Mountain.

Class 355—*Welsh Mountain Rams, Shearling and upwards.*

2595 I.—University College of North Wales, School of Agriculture, Bangor, for Snowdon G.5, born in 1933.
2594 II.—Major Eric J. W. Platt, Madryn Farm, Aber, for Glan H.8 5626, born in 1934, bred by J. O. Pritchard, Glan Mor, Isa, Talybont, Bangor.
2596 III.—University College of North Wales, for Vivod H.7, born 1934, bred by Capt. W. Best, Vivod, Llangollen.
2592 R.N.—Llysfasi Farm Institute, Ruthin, Denbighshire, for Dyserth D.H. G.5.
H.C.—2593.

Class 356.—*Three Welsh Mountain Shearling Ewes.*

2598 I.—Llysfasi Farm Institute, Ruthin, Denbighshire.
2597 II.—Llysfasi Farm Institute, for ewes, bred by R. T. Roberts, Dyserth Hall, Dyserth.
2601 III.—University College of North Wales, School of Agriculture, Bangor.
2600 R.N.—Major Eric J. W. Platt, Madryn Farm, Aber.

Black Welsh Mountain.

Class 357.—*Black Welsh Mountain Shearling Rams.*

2606 I.—Major F. H. T. Jervoise, Herriard Park, Basingstoke, for ram, bred by Mrs. Jervoise.
2607 II.—Mrs. Jervoise, Herriard Park, Basingstoke.
2605 III., & 2604 R.N.—The Hon. Mrs. C. Behrens, Swinton Grange, Malton, for ram, bred by the late Major C. Behrens.

Class 358.—*Three Black Welsh Mountain Shearling Ewes.*[1]

2608 I., & 2609 II.—The Hon. Mrs. C. Behrens, Swinton Grange, Malton, for ewes, bred by the late Major C. Behrens.
2610 III.—Major F. H. T. Jervoise, Herriard Park, Basingstoke, for ewes, bred by Mrs. Jervoise.
2611 R.N.—Mrs. Jervoise, Herriard Park, Basingstoke.

PIGS.

The Prizes in each Class for Pigs are : First, £10 ; Second, £5 ; Third, £3 ; Fourth, £2 ; Fifth, £1.

(*The numbers in brackets refer to the Tattoo or Ear Numbers of the Animals.*)

Class 359.—*Large White Boars, born in or before* 1934.

2613 **I., Champion[2] & Champion.[3]**—Chivers & Sons, Ltd., Histon, Cambridge, for Tring Basil 3rd 91029 (9), born Jan. 24, 1934, bred by H. W. Bishop, Park Hill Farm, Tring ; *s.* Aldenham Basil 12th 75449, *d.* Histon Dainty Girl 96th 195090 *by* Histon Bob 26th 69133.
2625 **II., R.N. for Champion[2] & R.N. for Champion.[3]**—H. W. White, Weston Hills, Spalding, for Tydd Kingmaker 17th 91069 (214), born Jan. 30, 1934, bred by A. B. Rose, Tydd, Wisbech ; *s.* Melford Kingmaker 52nd 77147, *d.* Tydd Primrose 225876 *by* Amcotts Peter 2nd 70675.

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[1] Prizes given by the Black Welsh Mountain Sheep Breeders' Association.

[2] Champion Gold Medal, or £5 cash, given by the National Pig Breeders' Association for the best Large White Boar.

[3] Silver Challenge Cup given by the National Pig Breeders' Association for the best Large White Pig.

2615 III.—Lord Daresbury, C.V.O., Walton Hall, Warrington, for **Walton Jay 134th** 96647 (4615), born July 1, 1934; *s.* Walton Jay 58th 81761, *d.* Ford Belle 42nd 221478 *by* Tockwith Beaverbrook 5th 77899.

2623 IV.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Wratting Kingmaker 8th** 97147 (341), born July 29, 1934; *s.* Melford Kingmaker 76th 84819, *d.* Wratting Mana 12th 217176 *by* Wratting Bar None 66409.

2619 R.N.—J. Pierpont Morgan, Wall Hall, Aldenham, Watford, for **Aldenham Bradbury 47th** 87133 (28), born July 7, 1933; *s.* Aldenham Bradbury 15th 75459, *d.* Aldenham Beryl 187862 *by* Aldenham Brigadier 55669.

H.C.—2618, 2620. C.—2616, 2617.

Class 360.—*Large White Boars, born in* 1935, *before July* 1.

2637 I.—J. Pierpont Morgan, Wall Hall, Aldenham, Watford, for **Aldenham General 23rd** 92393 (1161), born Jan. 9; *s.* Aldenham General 7th 75475, *d.* Aldenham Lady Mollington 50th 228712 *by* Aldenham Basil 12th 75449.

2645 II.—Col. C. J. H. Wheatley, Berkswell Hall, Coventry, for **Berkswell Jay 15th** 230464 (1430), born Jan. 13; *s.* Walton Jay 69th 86153, *d.* Burnham Topaz Lady *by* Creek Bradbury 27th 76061.

2629 III.—Lord Daresbury, C.V.O., Walton Hall, Warrington, for **Walton Bandmaster 127th** (5223), born March 27; *s.* Walton Bandmaster 115th 92311, *d.* Walton Bonetta 87th 239602 *by* Hardwick Major 71855.

2643 IV.—E. Thomlinson & Son, Hall Farm, Hutton Wandesley, Marston, York., for **Tockwith Silver Jubilee 2nd** (4632), born Jan. 3; *s.* Aldenham Basil Mollington 3rd 87087, *d.* Tockwith Blackberry 6th 182364 *by* Packwood Prince Edward 57453.

2633 V.—Ernest Harding, Packwood Grange, Dorridge, Birmingham, for **Packwood Bar None 52nd** (5102), born Jan. 10; *s.* Packwood Bar None 33rd 85067, *d.* Packwood Brocade 50th 214770 *by* Glebe Rock Sand 71615.

2644 R.N.—W. L. Vawser, Oakhurst, Regent Avenue, March, Cambs., for **Tring Basil.**

H.C.—2626, 2631. C.—2630, 2641.

Class 361.—*Large White Boars, born in* 1935, *on or after July* 1.[1]

2657 I.—Alfred Lewis, Panworth Hall, Ashill, Thetford, for **Westacre Broker 49th** (6849), born July 2; *s.* Westacre Bradbury 943rd 91621, *d.* Westacre Belle 112th 216488 *by* Creek Premier 76087.

2660 II.—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Wratting Bandmaster 15th** (W.829), born July 1; *s.* Woodborough Bandmaster 142nd 917163, *d.* Wratting Dahlia 227184 *by* Wratting King David 5th 78741.

2651 III.—Lord Daresbury, C.V.O., Walton Hall, Warrington, for **Walton Prince George 21st** (5484), born July 2; *s.* Barfield Prince George 4th 82969, *d.* Crimwell Dearest 220738 *by* Walton Jay 53rd 78235.

2654 IV.—Ernest Harding, Packwood Grange, Dorridge, Birmingham, for **Packwood Harmony** (5315), born July 6; *s.* Heighington Harmony 98th 89158, *d.* Packwood Merrylegs 9th 236848 *by* Glebe Rock Sand 71615.

2650 V.—E. E. Cocks, Fardel Manor, Ivybridge, Devon, for **Fardel Bradbury 17th** (197), born Aug. 3; *s.* Bladen Bradbury 35th 79601, *d.* Fardel Bonetta 6th 221370 *by* Tockwith Royal Prince 6th 81493.

2667 R.N.—H. W. White, Weston Hills, Spalding, for **Weston David 7th.**

H.C.—2649, 2668. C.—2659, 2662.

Class 362.—*Large White Boars, born in* 1936.

2681 I.—Lord Daresbury, C.V.O., Walton Hall, Warrington, for **Walton Basil** (5751), born Jan. 3; *s.* Tring Basil 4th 96209, *d.* Crimwell Dearest 220738 *by* Walton Jay 53rd 78235.

2694 II.—Alfred Lewis, Panworth Hall, Ashill, Thetford, for **Westacre Broker 73rd** (7083), born Jan. 5; *s.* Westacre Bradbury 943rd 91621, *d.* Weston Mary 6th 240036 *by* Westacre Bradbury 581st 81859.

2682 III.—Lord Daresbury, C.V.O., for **Walton Jay 165th** (5828), born Jan. 24; *s.* Walton Jay 58th 81761, *d.* Whittingham Maid 33rd 226860 *by* Whittingham Bradbury 3rd 73537.

2684 IV.—D. R. Daybell & Son, Bottesford, Nottingham, for **Bottesford Bradbury 48th** (753), born Jan. 8; *s.* Spalding Bradbury 29th 85405, *d.* Bottesford Buttercup 196th 230154 *by* Walton Boy 42nd 73357.

2704 V.—Col. C. J. H. Wheatley, Berkswell Hall, Coventry, for **Berkswell King David** (1796), born Jan. 6; *s.* Caldmore King David 35th 93083, *d.* Wall Maple 2nd 252094 *by* Wall Lion 39th 85915.

2700 R.N.—John Scholey, Northfield House, Birkin, Ferrybridge, Yorks., for **Beal Hercules 109th.**

H.C.—2669, 2670, 2672. C.—2686, 2701, 2705, 2707.

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[1] Prizes, except Fourth and Fifth, given by the National Pig Breeders' Association.

Class 363.—*Large White Breeding Sows, born in or before* 1934.

2723 **I. & R.N. for Champion.**[1]—FRANK SAINSBURY, Blunts Hall, Little Wratting, Haverhill, for **Wratting Mana 15th 217182 (536)**, born Feb. 26, 1932, farrowed May 11; *s.* Wratting King David 5th 78741, *d.* Wratting Mana 8th 217168 *by* Wratting Bradbury 5th 70491.

2714 **II.**—LORD DARESBURY, C.V.O., Walton Hall, Warrington, for **Whittingham Maid 33rd 226860 (1764)**, born Aug. 4, 1932, farrowed Jan. 24, bred by Whittingham County Mental Hospital Committee, Preston; *s.* Whittingham Bradbury 3rd 73537, *d.* Elston Maid 2nd 212864 *by* Wall Lion 19th 73343.

2712 **III.**—ERNEST A. CROOKES, Rose Cottage Farm, Cutthorpe, Chesterfield, for **Cutthorpe Model 4th 212632 (2949)**, born July 10, 1931, farrowed March 23; *s.* Newhall Banner 72465, *d.* Whittingham Model 5th 197916 *by* Abberton Brindle 55623.

2718 **IV.**—J. PIERPONT MORGAN, Wall Hall, Aldenham, Watford, for **Aldenham Dainty Girl 23rd 219026 (5397)**, born July 8, 1932, farrowed Feb. 21; *s.* Aldenham Bradbury 15th 75459, *d.* Histon Dainty Girl 96th 195090 *by* Histon Bob 26th 69133.

2722 **V.**—J. W. ROBERTS, Hill Farm, Shefford, Beds., for **Shefford Beryl 250504 (55)**, born May 27, 1933, farrowed Feb. 14; *s.* Shefford Masterpiece 81189, *d.* Histon Beryl 323rd 213620 *by* Aldenham Basil 70611.

2713 **R.N.**—LORD DARESBURY, C.V.O., for **Walton Catalina 13th.**
H.C.—2711, 2716, 2717, 2721, 2725. **C.**—2710, 2726.

Class 364.—*Large White Sows, born in* 1935, *before July* 1.

2732 **I.**—LORD DARESBURY, C.V.O., Walton Hall, Warrington, for **Walton Lassie 112th (5148)**, born Feb. 15; *s.* Taunton Turk 25th 66009, *d.* Walton Lassie 76th 226258 *by* Adlington Hercules 3rd 59901.

2741 **II.**—FRANK SAINSBURY, Blunts Hall, Little Wratting, Haverhill, for **Wratting Empress 12th 253570 (W.536)**, born Jan. 1; *s.* Woodborough Bandmaster 142nd 91763, *d.* Wratting Empress 7th 217166 *by* Wratting King David 3rd 78737.

2744 **III.**—E. THOMLINSON & SON, Hall Farm, Hutton Wandesley, Marston, York, for **Cawton Blackberry 3rd (22)**, born Jan. 25, bred by R. B. Hicks, Cawton, Hovingham, York; *s.* Walton Turk 110th 91487, *d.* Cawton Blackberry 2nd 230702 *by* Tockwith Beeverbrook 7th 81449.

2733 **IV.**—D. R. DAYBELL & SON, Bottesford, Nottingham, for **Bottesford Buttercup 212th (680)**, born Jan. 5; *s.* Walton Boy 42nd 73357, *d.* Bottesford Buttercup 124th 188272 *by* Edmonton Bradbury 3rd 56491.

2738 **V.**—ROWLAND P. HAYNES, Delves Green Farm, Walsall, for **Caldmore Princess 2nd (4962)**, born Jan. 28; *s.* Caldmore King David 29th 75887, *d.* Whittingham Princess 86th 203532 *by* Dalton Lion 60489.

2748 **R.N.**—COL. C. J. H. WHEATLEY, Berkswell Hall, Coventry, for **Berkswell Laura 3rd.**
H.C.—2731, 2740, 2745. **C.**—2728, 2736.

Class 365.—*Large White Sows, born in* 1935, *on or after July* 1.

2758 **I. & Champion.**[1]—LORD DARESBURY, C.V.O., Walton Hall, Warrington, for **Walton Dearest 3rd (5487)**, born July 2; *s.* Barfield Prince George 4th 82969, *d.* Crimwell Dearest 220738 *by* Walton Jay 53rd 78235.

2753 **II.**—CHIVERS & SONS, LTD., Histon, Cambridge, for **Histon Dainty Girl 364th (S.426)**, born July 28; *s.* Histon Bob 96th 89295, *d.* Histon Dainty Girl 178th 213684 *by* Aldenham Basil 70611.

2768 **III.**—FRANK SAINSBURY, Blunts Hall, Little Wratting, Haverhill, for **Wratting Dahlia 4th (W.832)**, born July 1; *s.* Woodborough Bandmaster 142nd 91763, *d.* Wratting Dahlia 227184 *by* Wratting King David 5th 78741.

2766 **IV.**—J. PIERPONT MORGAN, Wall Hall, Aldenham, Watford, for **Watford Dainty Girl (350)**, born July 1, bred by Watford Corporation; *s.* Taunton Neglected 8th 95985, *d.* Aldenham Dainty Girl 67th 242116 *by* Aldenham Basil 12th 75449.

2772 **V.**—COL. C. J. H. WHEATLEY, Berkswell Hall, Coventry, for **Berkswell Queen 32nd (1639)**, born July 3; *s.* Walton Jay 69th 86153, *d.* Berkswell Queen 2nd 211552 *by* Newhall Banner 72465.

2762 **R.N.**—ROWLAND P. HAYNES, Delves Green Farm, Walsall, for **Caldmore Finella A.J.**

H.C.—2755, 2756, 2761, 2769, 2771. **C.**—2750, 2757, 2776.

Class 366.—*Large White Sows, born in* 1936.

2783 **I.**—CHIVERS & SONS, LTD., Histon, Cambridge, for **Histon Blackberry 67th (S.626)**, born Jan. 1; *s.* South Eau Histonian 90579, *d.* Histon Blackberry 60th 247140 *by* Histon Bob 96th 89295.

2806 **II.**—COL. C. J. H. WHEATLEY, Berkswell Hall, Coventry, for **Berkswell Dainty Girl 10th (1794)**, born Jan. 3; *s.* Tockwith Basil 3rd 90871, *d.* Tring Dainty Girl 5th 251634 *by* Westacre Bradbury 939th 91619.

2796 **III.**—ALFRED LEWIS, Panworth Hall, Ashill, Thetford, for **Westacre Mary 39th (7084)**, born Jan. 5; *s.* Westacre Bradbury 943rd 91621, *d.* Weston Mary 6th 240036 *by* Westacre Bradbury 581st 81859.

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[1] Champion Gold Medal, or £5 cash, given by the National Pig Breeders' Association for the best Large White Sow.

2789 IV.—LORD DARESBURY, C.V.O., Walton Hall, Warrington, for **Walton Primrose 133rd** (5745), born Jan. 2; *s.* Tring Basil 4th 96209, *d.* Walton Primrose 126th 252302 *by* Walton Jay 58th 81761.

2803 V.—E. THOMLINSON & SON, Hall Farm, Hutton Wandesley, Marston, York, for **Tockwith Blackberry 118th** (5841), born Jan. 3; *s.* Walton Boy 216th 91353, *d.* Tockwith Blackberry 108th *by* Wall King David 46th 81631.

2793 R.N.—ERNEST HARDING, Packwood Grange, Dorridge, Birmingham, for **Packwood Dainty Girl 7th.**

H.C.—2778, 2782, 2795, 2804, 2807. C.—2779, 2785, 2786, 2788, 2802.

2660, 2723, 2741, 2768 **Special I.**[1]—FRANK SAINSBURY, for **Wratting Bandmaster 15th, Wratting Mana 15th, Wratting Empress 12th and Wratting Dahlia 4th.**

2645, 2748, 2772, 2806 **Special II.**[1]—COL. C. J. H. WHEATLEY, for **Berkswell Jay 15th, Berkswell Laura 3rd, Berkswell Queen 32nd and Berkswell Dainty Girl 10th.**

2681, 2732, 2758, 2789 **Special III.**[1]—LORD DARESBURY, C.V.O., for **Walton Basil, Walton Lassie 112th, Walton Dearest 3rd and Walton Primrose 133rd.**

Middle Whites.

Class 367.—*Middle White Boars, born in or before* 1934.

2811 **I., Champion[2] & Champion.[3]**—CHIVERS & SONS, LTD., Histon, Cambridge, for **Histon Marmion 6th 79067** (142), born July 27, 1931; *s.* Fordon Marmion 74061, *d.* Histon Rosebud 43rd 186808 *by* Hammonds Herald 44353.

2812 II.—THE HON. E. A. GUINNESS, Holmbury House, Holmbury St. Mary, Dorking, for **Watford Gracious Marmion 92273** (60), born Aug. 27, 1934, bred by Watford Corporation; *s.* Histon Marmion 19th 86839, *d.* Watford Gracious Lady 228370 *by* Wiggenhall Clinker 16th 79307.

2816 III.—R. A. VESTEY, Valence, Westerham, Kent, for **Dunsdale Bold Knight 2nd** 86759 (117), born Jan. 3, 1934; *s.* Shawlands Bold Knight 10th 82631, *d.* Shawlands Dorothy 64th 210684 *by* Shawlands Bold Boy 2nd 74471.

2813 R.N.—LESLIE K. OSMOND, Barnoldby-le-Beck, Grimsby, for **Beelsby Deliverance 2nd.**

Class 368.—*Middle White Boars, born in* 1935, *before July* 1.

2817 I.—CHIVERS & SONS, LTD., Histon, Cambridge, for **Histon Marmion 34th 92211** (918), born Jan. 1; *s.* Histon Marmion 6th 79067, *d.* Histon Woodlands 32nd 218162 *by* Histon Revel 20th 74991.

2819 II.—FRANK SAINSBURY, Blunts Hall, Little Wratting, Haverhill, for **Tring Prince 2nd** (26), born Feb. 1, bred by H. W. Bishop, Park Hill Farm, Tring; *s.* Newton Neptune 3rd 86909, *d.* Pendley Princess 50th 241780 *by* Amport Scotty 11th 62899.

Class 369.—*Middle White Boars, born in* 1935, *on or after July* 1.[4]

2821 **I. & R.N. for Champion.**[2]—CHIVERS & SONS, LTD., Histon, Cambridge, for **Watford Alderman** (232), born July 25, bred by Watford Corporation; *s.* Newton Neptune 3rd 86909, *d.* Cooling Helah 209552 *by* Amport Illuminator 10th 74677.

2824 II.—WATFORD CORPORATION, Holywell Farm, Watford, for **Watford Caractacus** (226), born July 22; *s.* Cooling Baron 9th 82297, *d.* Watford Gracious Lady 228370 *by* Wiggenhall Clinker 16th 79307.

2823 III.—R. A. VESTEY, Valence, Westerham, Kent, for **Dunsdale Chivalrous 3rd** (578) born July 3; *s.* Newton Chivalrous 82517, *d.* Dunsdale Dorothy 8th 241346 *by* Shawlands Bold Knight 10th 82631.

2282 R.N.—CAPT. R. SPEED, The Old Manor, Chalcombe, Banbury, for **Fearnside Sirdar.**

Class 370.—*Middle White Boars, born in* 1936.

2826 I.—JOSEPH S. HICKS, Fordon, Wold Newton, Driffield, for **Fordon Dictator** (443), born Jan. 2; *s.* Fordon Comrade 2nd 82333, *d.* Fordon Dulcie 227774 *by* Fordon Veteran 2nd 86785.

2825 II.—CHIVERS & SONS, LTD., Histon, Cambridge, for **Histon Woodman 40th** (2), born Jan. 3; *s.* Fordon Maurice 92135, *d.* Histon Woodlands 32nd 218162 *by* Histon Revel 20th 74991.

2828 III.—LESLIE K. OSMOND, Barnoldby-le-Beck, Grimsby, for **Beelsby Deliverance 8th** (1414), born Feb. 18; *s.* Beelsby Deliverance 2nd 86655, *d.* Beelsby Fuchsia 3rd 20930 *by* Salts Illuminator 59449.

2827 R.N.—LESLIE K. OSMOND, for **Beelsby Deliverance 7th.**

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[1] Special Prizes of £10 (First Prize), £5 (Second Prize) and £3 (Third Prize) given by the National Pig Breeders' Association for the best groups of four Large White Pigs, bred by Exhibitor. One Boar (at least) had to be included in each group, and not more than one entry selected from any one Class.

[2] Champion Gold Medal, or £5 cash, given by the National Pig Breeders' Association for the best Middle White Boar.

[3] Silver Challenge Cup given by the National Pig Breeders' Association for the best Middle White Pig.

[4] Prizes given by the National Pig Breeders' Association.

Class 371.—*Middle White Breeding Sows, born in or before* 1934.

2839 **I. & R.N. for Champion[1] & Champion.[2]**—WATFORD CORPORATION, Holywell Farm, Watford, for **Watford Gracious Lady** 228370 (762), born Feb. 6, 1933, farrowed Jan. 14; *s.* Wiggenhall Clinker 16th 79307, *d.* Shawlands Gracious Lady 11th 202520 *by* Shawlands Bold Boy 67965.

2835 **II. & R.N. for Champion.[2]**—THE HON. A. E. GUINNESS, Holmbury House, Holmbury St. Mary, Dorking, for **Pendley Helah 33rd** 218592 (618), born Jan. 1, 1933, farrowed Feb. 15, bred by Lord Kemsley, Pendley Manor, Tring; *s.* Wharfedale Wimple 68053, *d.* Salt's Helah 14th 177278 *by* Wharncliffe Prince 32625.

2836 **III.**—LESLIE K. OSMOND, Barnoldby-le-Beck, Grimsby, for **Pendley Princess Royal** 218602 (594), born Aug. 20, 1932, farrowed March 4, bred by Lord Kemsley, Pendley Manor, Tring; *s.* Wharfedale Wimple 68053, *d.* Pendley Princess 14th 200208 *by* Salts Deliverance 8th 55145.

2834 **R.N.**—CHIVERS & SONS, LTD., Histon, Cambridge, for **Histon Choice 188th.**
H.C.—2837

Class 372.—*Middle White Sows, born in* 1935, *before July* 1.

2843 **I.**—THE HON. A. E. GUINNESS, Holmbury House, Holmbury St. Mary, Dorking, for **Watford Helah** 241908 (85), born Jan. 18, bred by Watford Corporation; *s.* Cooling Don 86711, *d.* Cooling Helah 4th 227664 *by* Colton Vanguard 74815.

2847 **II.**—WATFORD CORPORATION, Holywell Farm, Watford, for **Watford Helah 3rd** (86), born Jan. 18; *s.* Cooling Don 86711, *d.* Cooling Helah 4th 227664 *by* Colton Vanguard 74815.

2845 **III.**—LESLIE K. OSMOND, Barnoldby-le-Beck, Grimsby, for **Beelsby Fuchsia 6th** 241152 (1267), born Jan. 17; *s.* Beelsby Deliverance 3rd 86657, *d.* Amport Fuchsia 20th 200886 *by* Amport Illuminator 4th 74661.

2842 **R.N.**—THE HON. A. E. GUINNESS, for **Holmbury Dorothy 16th.**
H.C.—2840. **C.**—2841.

Class 373.—*Middle White Sows, born in* 1935, *on or after July* 1.

2850 **I.**—FRANK SAINSBURY, Blunts Hall, Little Wratting, Haverhill, for **Wratting Miss Dorothy** (W.144), born July 5; *s.* Laybrook Sultan 2nd 74275, *d.* Shawlands Miss Dorothy 101st 228328 *by* Shawlands Bold Boy 40th 79245.

2848 **II.**—W. W. BUCKLE, Old Lane Farm, Colton, Tadcaster, for **Colton Rose Marie** (370), born July 7; *s.* Fulford Clink 82351, *d.* Colton Joyful 4th 241310 *by* Wiggenhall Clinker Boy 82675.

2852 **III.**—WATFORD CORPORATION, Holywell Farm, Watford, for **Watford Gracious Lady 14th** (242), born July 26; *s.* Cooling Baron 9th 82297, *d.* Watford Gracious Lady 5th 228378 *by* Wiggenhall Clinker 16th 79307.

2849 **R.N.**—LESLIE K. OSMOND, Barnoldby-le-Beck, Grimsby, for **Beelsby Fuchsia 9th.**
H.C.—2851.

Class 374.—*Middle White Sows, born in* 1936.

2862 **I.**—WATFORD CORPORATION, Holywell Farm, Watford, for **Watford Helah 7th** (272), born Jan. 9; *s.* Watford Gracious Marmion 92273, *d.* Cooling Helah 209552 *by* Amport Illuminator 10th 74677.

2854 **II.**—CHIVERS & SONS, LTD., Histon, Cambridge, for **Histon Lady Holly 67th** (5), born Jan. 7; *s.* Histon Marmion 23rd 86841, *d.* Hammonds Holly Tree 2nd 227858 *by* Newton Trumpeter 75105.

2857 **III.**—LESLIE K. OSMOND, Barnoldby-le-Beck, Grimsby, for **Beelsby Garland 5th** (1405), born Jan. 2; *s.* Beelsby Deliverance 2nd 86655, *d.* Beelsby Garland 227490 *by* Newton Deliverance 2nd 82519.

2855 **IV.**—JOSEPH S. HICKS, Fordon, Wold Newton, Driffield, for **Fordon Docile** (449), born Jan. 2; *s.* Fordon Comrade 2nd 82333, *d.* Fordon Dulcie 227774 *by* Fordon Veteran 2nd 86785.

2861 **R.N.**—WATFORD CORPORATION, for **Watford Gracious Lady 15th.**
H.C.—2859. **C.**—2860.

2824, 2839, 2847, 2862 **Special I.[3]**—WATFORD CORPORATION, for **Watford Caractacus, Watford Gracious Lady, Watford Helah 3rd and Watford Helah 7th.**

2811, 2817, 2825, 2854 **Special II.[3]**—CHIVERS & SONS, LTD., for **Histon Marmion 6th, Histon Marmion 34th, Histon Woodman 40th and Histon Lady Holly 67th.**

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[1] Silver Challenge Cup given by the National Pig Breeders' Association for the best Middle White Pig.

[2] Champion Gold Medal, or £5 cash, given by the National Pig Breeders' Association for the best Middle White Sow.

[3] Special Prizes of a Gold Medal or £5 cash (First Prize) and a Silver Gilt Medal or £2 10s. cash (Second Prize) given by the National Pig Breeders' Association for the best groups of four Middle White Pigs, bred by Exhibitor. One Boar (at least) had to be included in each group, and not more than one entry selected from any one Class.

Tamworths.

Class 375.—*Tamworth Boars, born in or before* 1934.

2865 **I. & R.N. for Champion.**[1]—Mrs. M. C. Inge, Thorpe Hall, Tamworth, for **Wall Ducat** 92041 (199), born July 11, 1933, bred by W. W. Ryman, Wall, Lichfield; *s.* Wall Dude 86641, *d.* Burnham Sailors Lass 2nd 198406 *by* Milton Prince 2nd 66503.

2866 **II.**—T. R. Wilson, Victoria House, Rufforth, York, for **Rufforth Royal Leader 2nd** 97295 (240), born Aug. 2, 1934; *s.* Rufforth Model Boy 86631, *d.* Inge Patience 2nd 198442 *by* Basildon Nomen 3rd 64133.

2863 **III.**—Mrs. Carleton Cowper, Eamont, Penrith, for **Coldfield Millar** 86615 (105), born May 23, 1933, bred by J. A. Frost, Coldfield; *s.* Berkswell Up-to-date 78813, *d.* Coldfield Myra 217344 *by* Coldfield Mike 70575.

2864 **R.N.**—Mrs. Carleton Cowper, for **Eamont Carmine.**

Class 376.—*Tamworth Boars, born in* 1935.[2]

2867 **I. & Champion.**[1]—Mrs. Carleton Cowper, Eamont, Penrith, for **Eamont Hero** 97265 (27), born Feb. 6; *s.* Coldfield Millar 86615, *d.* Berkswell Rose 9th 227348 *by* Berkswell Peter 3rd 82187.

2868 **II.**—T. R. Wilson, Victoria House, Rufforth, York, for **Wall Sailor** 97297 (237), born Jan. 9, bred by W. W. Ryman, Wall, Lichfield; *s.* Milton Sailor 3rd 86619, *d.* Burnham Sea Maiden 227368 *by* Hacking Ruddyglow 73841.

Class 377.—*Tamworth Boars, born in* 1936.

2871 **I.**—Mrs. Carleton Cowper, Eamont, Penrith, for **Eamont Governor** (52), born Jan. 1; *s.* Eamont Hero 97265, *d.* Eamont Fairy 253900 *by* Berkswell Luck 2nd 86593.

2870 **II.**—Mrs. Carleton Cowper, for **Eamont Gladiator** (51), born Jan. 1; *s.* Eamont Hero 97265, *d.* Eamont Fairy 253900 *by* Berkswell Luck 2nd 86593.

2872 **III.**—Mrs. M. C. Inge, Thorpe Hall, Tamworth, for **Inge's Victor 2nd** (137), born Feb. 3; *s.* Wall Ducat 92041, *d.* Inge's Viola 5th 227386 *by* Milton Fortune 16th 82229.

2869 **R.N.**—E. Clifton-Brown, Burnham Grove, Burnham, Bucks., for **Burnham Red Peter.**

Class 378.—*Tamworth Breeding Sows, born in or before* 1934.

2876 **I., R.N. for Champion[3] & R.N. for Champion.**[4]—T. R. Wilson, Victoria House, Rufforth, York, for **Rufforth Brilliant Girl 5th** 227424 (145), born Jan. 2, farrowed Feb. 12; *s.* Whittingham Dude 3rd 78871, *d.* Rufforth Brilliant Girl 2nd 209290 *by* Rufforth Bonny Boy 73865.

2875 **II.**—Mrs. M. C. Inge, Thorpe Hall, Tamworth, for **Inge's Viola 5th** 227386 (114), born July 15, 1932, farrowed Feb. 3; *s.* Milton Fortune 16th 82229, *d.* Inge's Viola 3rd 217362 *by* Coldfield Mike 70575.

2874 **III.**—Mrs. Carleton Cowper, Eamont, Penrith, for **Berkswell Rose 9th** 227348 (834), born Jan. 30, 1933, farrowed June 1, bred by Col. C. J. H. Wheatley, Berkswell Hall, Coventry; *s.* Berkswell Peter 3rd 82187, *d.* Berkswell Rose 4th 217282 *by* Dollar Bobbie 73777.

Class 379.—*Tamworth Sows, born in* 1935.

2878 **I., Champion[3] & Champion.**[4]—Mrs. Carleton Cowper, Eamont, Penrith, for **Eamont Heroine** 253908 (29), born Feb. 6; *s.* Coldfield Millar 86615, *d.* Berkswell Rose 9th 227348 *by* Berkswell Peter 3rd 82187.

2880 **II.**—Rowland P. Haynes, Delves Green Farm, Walsall, for **Caldmore Beauty 2nd** (4964), born Feb. 13; *s.* Berkswell Up-to-Date 5th 82191, *d.* Berkswell Beauty 17th 227322 *by* Wall Up-to-Date 73887.

2879 **III.**—Rowland P. Haynes, for **Caldmore Beauty** (4966), born Feb. 13; *s.* Berkswell Up-to-Date 5th 82191, *d.* Berkswell Beauty 17th 227322 *by* Wall Up-to-Date 73887.

2877 **R.N.**—Mrs. Carleton Cowper, for **Eamont Fairy.**

Class 380.—*Tamworth Sows, born in* 1936.

2886 **I.**—T. R. Wilson, Victoria House, Rufforth, York, for **Rufforth Golden Duchess** (335), born Jan. 16; *s.* Wall Gold Getter 82247, *d.* Rufforth Lass 3rd 241098 *by* Berkswell Peter 3rd 82187.

2887 **II.**—T. R. Wilson, for **Rufforth Precious Pearl** (333), born Jan. 16; *s.* Wall Gold Getter 82247, *d.* Rufforth Lass 2nd 241098 *by* Berkswell Peter 3rd 82187.

2883 **III.**—Mrs. Carleton Cowper, Eamont, Penrith, for **Eamont Gladys** (56), born Jan. 1; *s.* Eamont Hero 97265, *d.* Eamont Fairy 253900 *by* Berkswell Luck 2nd 86593.

2885 **R.N.**—Mrs. M. C. Inge, Thorpe Hall, Tamworth, for **Inge's Velvet 3rd.**

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[1] Champion Silver Gilt Medal, or £2 10*s.* in cash, given by the National Pig Breeders' Association for the best Tamworth Boar.

[2] Prizes given by the National Pig Breeders' Association.

[3] Champion Silver Gilt Medal, or £2 10*s.* in cash, given by the National Pig Breeders' Association for the best Tamworth Sow.

[4] Silver Challenge Cup given by the National Pig Breeders' Association for the best Tamworth Pig.

Berkshires.

Class 381.—*Berkshire Boars, born in or before* 1934.

2890 **I., Champion[1] & R.N. for Champion.[2]**—FRANK TOWNEND, Highfield, Moor Allerton, Leeds, for **Dringhouses Resolute** 3933 (102), born July 19, 1933, bred by Col. G. E. Wilkinson, C.B.E., D.S.O., Dringhouses Manor, York; *s.* Suddon Sharper 3755, *d.* Dringhouses Viola 13258 *by* Swinton John 2643.

2889 **II.**—CHARLES R. DUNKLEY, Hill Crest, Harlestone, Northampton, for **Warkton Musician** 3983 (41), born Jan. 17, 1934; *s.* Warkton Claude 3895, *d.* Warkton Songstress 13948 *by* Warkton Consul 3781.

2891 **III.**—COL. G. E. WILKINSON, C.B.E., D.S.O., Dringhouses Manor, York, for **Highfield Royal President 43rd** 3939 (80), born Sept. 29, 1933, bred by Frank Townend, Highfield, Moor Allerton, Leeds; *s.* Highfield Roy President 6th 1638, *d.* Highfield Ada Margaret 2nd 13794 *by* Bridge Keyring 2771.

2888 **R.N.**—E. CLIFTON-BROWN, Burnham Grove, Burnham, Bucks., for **Burnham Prim Boy.**

Class 382.—*Berkshire Boars, born in* 1935, *before July* 1.

2894 **I.**—JOHN CROWE, Ashe Manor, Overton, Hants., for **Foxley Nutmeg** 4043 (22), born Jan. 10, bred by P. Gold, Foxley Cottage, Binfield, Berks.; *s.* Hillsborough Nutmeg 2nd 3513, *d.* Foxley Lady Prue 13764 *by* Hillsborough Hercules 3503.

2893 **II.**—THE HON. MRS. C. BEHRENS, Swinton Grange, Malton, for **Swinton Marius** (44), born May 23, bred by the late Major C. Behrens, Swinton Grange; *s.* Lenton Keystone 10th 3865, *d.* Swinton Smiling Margaret 2nd 14098 *by* Syerston President 6th 3393.

Class 383.—*Berkshire Boars, born in* 1935, *on or after July* 1.[3]

2897 **I. & R.N. for Champion.[1]**—E. CLIFTON-BROWN, Burnham Grove, Burnham, Bucks., for **Burnham Prim President** (749), born July 23; *s.* Highfield Royal President 44th 4051, *d.* Burnham Winifred Girl 14020 *by* Burnham Prim Lad 3825.

2900 **II.**—STEPHEN D. PLAYER, Whatton Manor, Whatton-in-the-Vale, Nottingham, for **Lenton Keystone 20th** (13), born July 7, bred by S. Cecil Armitage, Lenton Fields, Nottingham; *s.* Lenton Keystone 2nd 3711, *d.* Lenton Venus 13846 *by* Lenton British Baron 2nd 2135.

2899 **III.**—CHARLES R. DUNKLEY, Hill Crest, Harlestone, Northampton, for **Warkton Call Boy** (53), born July 2; *s.* Warkton Musician 3893, *d.* Warkton Memory 14144 *by* Ringstead Baronet 3745.

2896 **R.N.**—THE HON. MRS. C. BEHRENS, Swinton Grange, Malton, for **Highfield Royal President 51st.**

H.C.—2902.

Class 384.—*Berkshire Boars, born in* 1936.

2903 **I.**—THE HON. MRS. C. BEHRENS, Swinton Grange, Malton, for **Swinton King** (1), born Jan. 3; *s.* Lenton Keystone 10th 3865, *d.* Swinton Smiling Margaret 5th *by* Syerston President 6th 3393.

2904 **II.**—E. CLIFTON-BROWN, Burnham Grove, Burnham, Bucks., for **Burnham Cinnamon Master** (1), born Jan. 3; *s.* Highfield Royal President 44th 4051, *d.* Burnham Cinnamon 13126 *by* Burnham Forest Lunn 2781.

2906 **III.**—CHARLES R. DUNKLEY, Hill Crest, Harlestone, Northampton, for **Warkton Comedian** (60), born Jan. 3; *s.* Warkton Musician 3983, *d.* Burnham Salina 14256 *by* Hillsborough Nutmeg 2nd 3513.

2907 **R.N.**—STEPHEN D. PLAYER, Whatton Manor, Whatton-in-the-Vale, Nottingham, for **Whipling Archduke 6th.**

H.C.—2908.

Class 385.—*Berkshire Breeding Sows, born in or before* 1934.

2919 **I. & R.N. for Champion.[4]**—COL. G. E. WILKINSON, C.B.E., D.S.O., Dringhouses Manor, York, for **Dringhouses Diana 2nd** 14290 (108), born Jan. 19, 1934, farrowed Jan. 17; *s.* Suddon Sharper 3755, *d.* Dringhouses Diana 13248 *by* Swinton John 2643.

2911 **II.**—E. CLIFTON-BROWN, Burnham Grove, Burnham, Bucks., for **Burnham Griqua Gloriana 2nd** 14244 (686), born July 27, 1934, farrowed Jan. 14; *s.* Burnham Prim Lad 3825, *d.* Burnham Griqua Lass 3rd 13146 *by* Hammonds Petronious 2055.

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[1] Champion Silver Gilt Medal, or £2 10*s.* cash, given by the National Pig Breeders' Association for the best Berkshire Boar.

[2] Silver Challenge Bowl given by the National Pig Breeders' Association for the best Berkshire Pig.

[3] Prizes given by the National Pig Breeders' Association.

[4] Champion Silver Gilt Medal, or £2 10*s.* cash, given by the National Pig Breeders' Association for the best Berkshire Sow.

2913 III.—John Crowe, Ashe Manor, Overton, Hants., for **Burnham Oriana 13172 (559)**, born Jan. 25, 1932, farrowed Feb. 24, bred by E. Clifton-Brown, Burnham Grove, Burnham, Bucks.; *s.* Hillsborough Hercules 2nd 3687, *d.* Burnham Ophelia 2nd 12536 *by* Burnham Clarence 2779.

2912 R.N.—E. Clifton-Brown, for **Burnham Griqua Maid.**
H.C.—2916.

Class 386.—*Berkshire Sows, born in 1935, before July* 1.

2922 I., **Champion**[1] **& Champion.**[2]—Frank Townend, Highfield, Moor Allerton, Leeds, for **Dringhouses Excelsa 4th 14294 (130)**, born Jan. 9, bred by Col. G. E. Wilkinson, C.B.E., D.S.O., Dringhouses Manor, York; *s.* Highfield Roy President 6th 1638, *d.* Dringhouses Excelsa 13250 *by* Swinton John 2643.

2921 II.—John Crowe, Ashe Manor, Overton, Hants., for **Overton British Queen 14370 (54)**, born March 1; *s.* Highfield Royal Pygmalion 25th 3491, *d.* Burnham Oriana 13472 *by* Hillsborough Hercules 2nd 3687.

2920 III.—E. Clifton-Brown, Burnham Grove, Burnham, Bucks., for **Burnham Griqua Gaymaid 14236 (713)**, born Jan. 3; *s.* Burnham Prim Lad 3825, *d.* Burnham Griqua Maid 14006 *by* Lenton Keystone 3551.

Class 387.—*Berkshire Sows, born in 1935, on or after July* 1.

2928 I.—Frank Townend, Highfield, Moor Allerton, Leeds, for **Chapel Margaret 18th (1)**, born Aug. 12, bred by T. E. Prest, Swinton, Malton; *s.* Chapel Royal 3925, *d.* Swinton Super Margaret 3rd 14108 *by* Woodhouse Amanullah 2nd 2691.

2924 II.—E. Clifton-Brown, Burnham Grove, Burnham, Bucks., for **Burnham Griqua Noravina (761)**, born July 8; *s.* Hillsborough Nutmeg 2nd 3513, *d.* Burnham Griqua Girl 13136 *by* Hillsborough Mr. Prim 6th 3231.

2926 III.—John Crowe, Ashe Manor, Overton, Hants., for **Overton British Queen 9th (75)**, born Aug. 20; *s.* Highfield Royal Pygmalion 29th 3943, *d.* Burnham Oriana 13172 *by* Hillsborough Hercules 2nd 3687.

2927 R.N.—Charles R. Dunkley, Hill Crest, Harlestone, Northampton, for **Warkton Rosemary.**
H.C.—2925.

Class 388.—*Berkshire Sows, born in* 1936.

2936 I.—Stephen D. Player, Whatton Manor, Whatton-in-the-Vale, Nottingham, for **Whipling Amelia 13th (48)**, born Jan. 8; *s.* Highfield Royal Pygmalion 28th 3941, *d.* Whipling Amelia 3rd 13954 *by* Lenton British Duke 2nd 3543.

2935 II.—Stephen D. Player, Whatton-in-the-Vale, Nottingham, for **Whipling Amelia 11th (46)**, born Jan. 5; *s.* Lenton British Duke 2nd 3543, *d.* Swinton Hopeful Amelia 2nd 12908 *by* Highfield Roy President 6th 1638.

2934 III.—Charles R. Dunkley, Hill Crest, Harlestone, Northampton, for **Warkton Singing Sally (60)**, born Jan. 3; *s.* Warkton Musician 3983, *d.* Burnham Salina 14256 *by* Hillsborough Nutmeg 2nd 3513.

2937 R.N.—Frank Townend, Highfield, Moor Allerton, Leeds, for **Chapel Rosary.**
C.—2938.

Wessex Saddlebacks.

Class 389.—*Wessex Saddleback Boars, born in or before* 1934.

2945 I., **Champion**[3] **& Champion.**[4]—Douglas Vickers, Preston, Hitchin, for **Preston Officer 3880**, born Jan. 2, 1934; *s.* Preston Val 3673, *d.* Preston Oonagh 15443 *by* Paul of Preston 3222.

2939 II.—Fred W. Gentle, Avenue House, Brandon, Suffolk, for **Brandon David 2nd 3737**, born Jan. 7, 1933; *s.* Brandon David 3495, *d.* Brandon Poppy 11th 16074 *by* Brandon Dunstan 3161.

2941 III.—M. G. Ling, Ashe-Ingen Court, Ross-on-Wye, for **Lavington Guardsman 3797**, born Aug. 13, 1933, bred by H. T. Holloway, West Lavington, Wilts.; *s.* Holbury Piper 3698, *d.* Lavington Fairy 16767 *by* Lavington Dandy 3432.

2944 R.N.—H. Shepherd, Walronds Farm, Baydon, Marlborough, for **Denford Dandy.**
H.C.—2940.

Class 390.—*Wessex Saddleback Boars, born in* 1935.[5]

2950 I. & R.N. **for Champion.**[3]—Henry T. Holloway, West Lavington, Wilts., for **Lavington Ironside 4049**, born July 15; *s.* Holbury Piper 3698, *d.* Lavington Helena 17557 *by* Godalming Forester 2nd 3451.

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[1] Silver Challenge Bowl given by the National Pig Breeders' Association for the best Berkshire Pig.

[2] Champion Silver Gilt Medal, or £2 10*s.* cash, given by the National Pig Breeders' Association for the best Berkshire Sow.

[3] Champion Silver Gilt Medal, or £2 10*s.* cash, given by the National Pig Breeders' Association for the best Wessex Saddleback Boar.

[4] Silver Challenge Cup given by the National Pig Breeders' Association for the best Wessex Saddleback Pig.

[5] Prizes given by the National Pig Breeders' Association.

2946 II.—H. L. Brooksbank, Sandrock, Tickhill, Yorks., for **Sandrock Frivolity 7th** 4039, born Aug. 26; *s.* Holmleigh Oak 3509, *d.* Sandrock Frivolous 9th 17211 *by* Yarty Monarch 5th 3408.

2949 III.—Fred W. Gentle, Avenue House, Brandon, Suffolk, for **Brandon Prior 5th** 4002, born July 2; *s.* Brandon Prior 3rd 3867, *d.* Henfield Part Thirty 17448 *by* Godalming Monarch 3785.

2954 **R.N.**—Douglas Vickers, Preston, Hitchin, for **Preston Vane.**

H.C.—2955, 2956.

Class 391.—*Wessex Saddleback Boars, born in* 1936.

2959 I.—Fred W. Gentle, Avenue House, Brandon, Suffolk, for **Brandon David 3rd** 4031, born Jan. 3; *s.* Brandon David 2nd 3737, *d.* Glinton Sunbeam 21st 17164 *by* Slythehurst Call Boy 3654.

2957 II.—H. L. Brooksbank, Sandrock, Tickhill, Yorks., for **Sid-Vale Sultan 4061**, born Jan. 5, bred by G. A. Cole, Sidbury Mills, Sidmouth; *s.* Holmleigh Lion 3894, *d.* Preston Swift 16366 *by* Yarty Monarch 3rd 3282.

2965 III.—Douglas Vickers, Preston, Hitchin, for **Preston Duke** 4060, born Jan. 6; *s.* Preston Vernon 3987, *d.* Preston Dinah 7th 18036 *by* Preston Val 3673.

2960 **R.N.**—Fred W. Gentle, for **Brandon King.**

H.C.—2958, 2962.

Class 392.—*Wessex Saddleback Breeding Sows, born in or before* 1934.

2969 **I., R.N. for Champion[1] & Champion.[2]**—Fred W. Gentle, Avenue House, Brandon, Suffolk, for **Glinton Sunbeam 16th 17161**, born April 10, 1933, farrowed Jan. 2, bred by H. Neaverson, Glinton, Peterborough; *s.* Slythehurst Call Boy 3654, *d.* Sobrite Sunbeam 5th 16358 *by* Preston Viceroy 3452.

2973 II.—Douglas Vickers, Preston, Hitchin, for **Preston Value 2nd 17539**, born March 1, 1934, farrowed Feb. 17; *s.* Holmsleigh Oak 3509, *d.* Preston Value 16333 *by* Yarty Monarch 3rd 3282.

2966 III.—H. L. Brooksbank, Sandrock, Tickhill, Yorks., for **Sandrock Gift 6th 17180**, born Jan. 22, 1934, farrowed Jan. 14; *s.* Pamber Dandy 2nd 3675, *d.* Sandrock Gift 3rd 16280 *by* Preston Odin 3369.

2968 **R.N.**—Fred W. Gentle, for **Brandon Poppy 15th.**

H.C.—2967, 2971, 2972, 2974.

Class 393.—*Wessex Saddleback Sows, born in* 1935.

2990 **I. & R.N. for Champion.[2]**—Douglas Vickers, Preston, Hitchin, for **Preston Velvet** 18124, born Feb. 1; *s.* Boreham Barrington 2nd 3803, *d.* Preston Virtue 6th 17256 *by* Yarty Monarch 3rd 3282.

2975 II.—H. L. Brooksbank, Sandrock, Tickhill, Yorks., for **Sandrock Frivolous 13th** 17583, born Jan. 4; *s.* Holmsleigh Oak 3509, *d.* Sandrock Frivolous 5th 16873 *by* Yarty Regent 3580.

2981 III.—F. W. Gilbert, The Manor, Chellaston, Derby, for **Chellaston Royal Druidess** 3rd 17579, born Jan. 15; *s.* Chellaston Royal's Son 2nd 3450, *d.* Chellaston Druidess 6th 16806 *by* Preston Tomahawk 3422.

2989 IV.—Douglas Vickers, for **Preston Avid 4th 18119**, born Jan. 3; *s.* Clough Earl 3744, *d.* Boreham Avid 6th 17200 *by* Slythehurst Romancer 3547.

2983 V.—Henry T. Holloway, West Lavington, Wilts., for **Lavington Ivy 18173**, born July 15; *s.* Holbury Piper 3698, *d.* Lavington Helena 17557 *by* Godalming Forester 2nd 3451.

2979 **R.N.**—Fred W. Gentle, Avenue House, Brandon, Suffolk, for **Brandon Daisy 3rd.**

H.C.—2977, 2986.

Class 394.—*Wessex Saddleback Sows, born in* 1936.

2996 I.—Fred W. Gentle, Avenue House, Brandon, Suffolk, for **Brandon Sunbeam 11th** 18227, born Jan. 2; *s.* Brandon David 2nd 3737, *d.* Glinton Sunbeam 16th 17161 *by* Slythehurst Call Boy 3654.

2997 II.—Fred W. Gentle, for **Brandon Sunbeam 12th 18228**, born Jan. 3; *s.* Brandon Monarch 2nd 3996, *d.* Brandon Sunbeam 17661 *by* Brandon Oak 2nd 3768.

2993 III.—G. A. Cole, Sidbury Mills, Sidmouth, for **Sid-Vale Swift 5th 18115**, born Jan. 5; *s.* Holmsleigh Lion 3894, *d.* Preston Swift 16366 *by* Yarty Monarch 3rd 3282.

2999 **R.N.**—W. R. Jackson, Chancellors Farm, Redhill, Wrington, Somerset, for **Chancellors Rosaleen.**

H.C.—3002.

2945, 2954, 2973, 2990 **Special I.[3]**—Douglas Vickers, for **Preston Officer, Preston Vane, Preston Value 2nd and Preston Velvet.**

2959, 2968, 2979, 2996 **Special II.[3]**—Fred W. Gentle, for **Brandon David 3rd, Brandon Poppy 15th, Brandon Daisy 3rd and Brandon Sunbeam 11th.**

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[1] Silver Challenge Cup given by the National Pig Breeders' Association for the best Wessex Saddleback Pig.

[2] Champion Silver Gilt Medal, or £2 10*s.* cash, given by the National Pig Breeders' Association for the best Wessex Saddleback Sow.

[3] Special Prizes of £3 (First Prize) and £2 (Second Prize) given by the National Pig Breeders' Association for the best groups of four Pigs, bred by Exhibitor.

Large Blacks.

Class 395.—*Large Black Boars, born in or before* 1934.

3007 **I. & Champion.**[1]—D. W. P. Gough, Pakenham Manor, Bury St. Edmunds, for **Tartar Talisman L51**, born Jan. 3, 1933, bred by G. A. Goodchild, Great Yeldham, Essex; *s.* Kedington None Such 3rd G293, *d.* Tartar Mary 4th G1414 *by* Kedington Broker E469.

3008 **II. & R.N. for Champion.**[1]—Miss Joan K. B. Little, Armsworth Hill, Alresford, for **Pakenham Sundial 2nd K243**, born July 25, 1932, bred by D. W. P. Gough, Pakenham Manor, Bury St. Edmunds; *s.* Yam Esk 2nd F129, *d.* Pakenham Sunshine 2nd G1740 *by* Pakenham Rambler F433.

3006 **III.**—F. W. Gilbert, The Manor, Chellaston, Derby, for **Fowlmere Night Boy 2nd K195**, born July 19, 1932, bred by W. C. Jackson, Fowlmere, Royston; *s.* Bardolph Night Boy E417, *d.* Fowlmere Fancy 2nd F364 *by* Bassingbourn Royal 2nd B641.

3010 **R.N.**—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Kedington Rotation 2nd.**

H.C.—3004. **C.**—3005.

Class 396.—*Large Black Boars, born in* 1935, *before July* 1.

3023 **I.**—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Kedington Proctor N189**, born Jan. 31; *s.* Pakenham Probable L197, *d.* Kedington Caress 3rd L326 *by* Kedington Broker E469.

3012 **II.**—F. G. Alexander, Laurels Farm, Pulham Market, Diss, for **Depwade Duke N31**, born Jan. 28; *s.* Pakenham Rally L195, *d.* Fowlmere Duchess 37th K998 *by* Bardolph Night Boy E417.

3017 **III.**—D. W. P. Gough, Pakenham Manor, Bury St. Edmunds, for **Pakenham Timepiece N273**, born Feb. 11; *s.* Pakenham Sundial 4th L193, *d.* Fowlmere Fancy 67th H598 *by* Bardolph Night Boy E417.

3022 **IV.**—N. Pomeroy & Son, East Stoke Farm, Stoke-under-Ham, Somerset, for **Stokehamdon Sundial 2nd N55**, born Jan. 3; *s.* Wick Down Emperor L143, *d.* Pakenham Sunshade 4th L624 *by* Westpetherwin Leader 2nd E553.

3018 **R.N.**—T. F. James, Warren Farm, Culham, Abingdon, for **Treluckey Royal 2nd.**

H.C.—3021.

Class 397.—*Large Black Boars, born in* 1935, *on or after July* 1.[2]

3029 **I.**—E. A. Warth, Upwood Hill House, Ramsey, Huntingdon, for **Upwood Pilot N313**, born July 3; *s.* Bardolph Night Boy E417, *d.* Upwood Levelside 1st L776 *by* Streetly Eagle H447.

3026 **II.**—D. W. P. Gough, Pakenham Manor, Bury St. Edmunds, for **Pakenham Impression N275**, born July 23; *s.* Trewithen Result M207, *d.* Pakenham Streamline M1058 *by* Westpetherwin Leader 2nd E553.

3025 **III.**—The Exors. of the late Earl of Dartmouth, Patshull House, Wolverhampton, for **Patshull Leader 30th N291**, born Aug. 15, bred by the late Earl of Dartmouth; *s.* Patshull Leader 7th H7, *d.* Tinten Princess 34th K384 *by* Westpetherwin Leader 2nd E553.

3028 **R.N.**—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Kedington Royal 2nd.**

H.C.—3024. **C.**—3027.

Class 398.—*Large Black Boars, born in* 1936.

3041 **I.**—N. Pomeroy & Son, East Stoke Farm, Stoke-under-Ham, Somerset, for **Stokehamdon Sundial 4th P3**, born Jan. 12; *s.* Banns Bumper M201, *d.* Pakenham Sunshade 4th L624 *by* Westpetherwin Leader 2nd E553.

3038 **II.**—D. W. P. Gough, Pakenham Manor, Bury St. Edmunds, for **Pakenham Judicious P27**, born Jan. 7; *s.* Pakenham Sundial 10th M271, *d.* Pakenham Judy L1150 *by* Pakenham Rotation H303.

3033 **III.**—Walter D. Craven, Upper Hurst, Hartington, Buxton, for **Hartington Don Giovanni P65**, born Jan. 16; *s.* Treluckey Sunray 2nd G555, *d.* Hartington Nocturne 3rd L506 *by* Broyle Laddie 1st H131.

3040 **IV.**—T. F. James, Warren Farm, Culham, Abingdon, for **Treluckey Yo Yo 1st P9**, born Jan. 3; *s.* Valley Didcot M329, *d.* Treluckey Progress 2nd L976 *by* Baydon Highlander 17th H419.

3034 **V.**—Walter D. Craven, for **Hartington Lycidas P63**, born Jan. 15; *s.* Treluckey Sunray 2nd G555, *d.* Orchard Beverley 60th L90 *by* Spella Park Dan H437.

3036 **R.N.**—F. W. Gilbert, The Manor, Chellaston, Derby, for **Chellaston Night Boy.**

H.C.—3035, 3042. **C.**—3030, 3037.

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[1] Silver Challenge Cup, and Gold Medal to the Breeder, given by the Large Black Pig Society for the best Large Black Boar.

[2] Prizes given by the Large Black Pig Society.

Class 399.—*Large Black Breeding Sows, born in or before* 1934.

3045 **I. & Champion.**[1]—F. G. Alexander, Laurels Farm, Pulham Market, Diss, for **Depwade Duchess 3rd M718**, born May 4, 1934, farrowed March 20; *s.* Orchard Royal Good Boy 4th F461, *d.* Fowlmere Duchess 37th K998 *by* Bardolph Night Boy E417.

3052 **II.**—D. W. P. Gough, Pakenham Manor, Bury St. Edmunds, for **Pakenham Fancy 7th L684**, born Jan. 3, 1933, farrowed Jan. 17; *s.* Westpetherwin Leader 2nd E553, *d.* Fowlmere Fancy 46th H518 *by* Bardolph Night Boy E417.

3051 **III.**—G. A. Goodchild, Great Yeldham Hall, Essex, for **Tartar Mary 10th L96**, born Jan. 3, 1933, farrowed Jan. 29; *s.* Kedington None Such 3rd G293, *d.* Tartar Mary 4th G1414 *by* Kedington Broker E469.

3050 **IV.**—F. W. Gilbert, The Manor, Chellaston, Derby, for **Chellaston Bangle 8th** L1086, born Nov. 15, 1933, farrowed Jan. 4; *s.* Chellaston Hector 2nd K139, *d.* Chellaston Bangle 2nd H810 *by* Pakenham Bouncer 1st G49.

3057 **V.**—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Kedington Constance 23rd G2184**, born July 28, 1930, farrowed Feb. 11; *s.* Kedington Stump B97, *d.* Kedington Constance 13th D2466 *by* Kedington Brigand C563.

3059 **R.N.**—E. A. Warth, Upwood Hill House, Ramsey, Huntingdon, for **Upwood Model 1st.**
H.C.—3046, 3047. **C.**—3048, 3053, 3054.

Class 400.—*Large Black Sows, born in* 1935, *before July* 1.

3066 **I. & R.N. for Champion.**[1]—D. W. P. Gough, Pakenham Manor, Bury St. Edmunds, for **Pakenham Delicious N756**, born Jan. 19; *s.* Tartar Talisman L51, *d.* Pakenham Delight 2nd L686 *by* Pakenham Rotation H303.

3071 **II.**—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhill, for **Kedington Bangle 3rd N544**, born April 29; *s.* Kedington Royal L231, *d.* Streetly Bangle 79th H1908 *by* Streetly Actor F413.

3069 **III.**—N. Pomeroy & Son, East Stoke Farm, Stoke-under-Ham, Somerset, for **Stokehamdon Sunshine N90**, born Jan. 3; *s.* Wick Down Emperor L143, *d.* Pakenham Sunshade 4th L624 *by* Westpetherwin Leader 2nd E553.

3072 **IV.**—Frank Sainsbury, for **Kedington Dora 4th N182**, born Jan. 2; *s.* Pakenham Probable L197, *d.* Fowlmere Dora 13th K1006 *by* Bardolph Night Boy E417.

3064 **V.**—F. W. Gilbert, The Manor, Chellaston, Derby, for **Chellaston Wonder Pearl 2nd N82**, born Jan. 11; *s.* Chellaston Hector 2nd K139, *d.* Chellaston Pearl 5th G824 *by* Tinten Result E371.

3061 **R.N.**—F. G. Alexander, Laurels Farm, Pulham Market, Diss, for **Depwade Duchess 6th.**
H.C.—3070. **C.**—3067.

Class 401.—*Large Black Sows, born in* 1935, *on or after July* 1.

3079 **I.**—D. W. P. Gough, Pakenham Manor, Bury St. Edmunds, for **Pakenham Insurance 2nd N758**, born July 21; *s.* Tartar Talisman L51, *d.* Fowlmere Famous 31st H590 *by* Bardolph Night Boy E417.

3077 **II.**—F. W. Gilbert, The Manor, Chellaston, Derby, for **Chellaston Bangle 15th** N776, born July 3; *s.* Pakenham Mustard K239, *d.* Chellaston Bangle 9th L1088 *by* Chellaston Hector 2nd K139.

3078 **III.**—G. A. Goodchild, Great Yeldham Hall, Essex, for **Tartar Augusta 8th N946**, born July 29; *s.* Patshull Ipswich Royal M11, *d.* Tartar Augusta 6th M856 *by* Pencorse Enterprise L23.

3088 **IV.**—Frank Sainsbury, Blunts Hall, Little Wratting, Haverhil, for **Kedington Constance 57th N894**, born July 19; *s.* Pakenham Probable L197, *d.* Kedington Constance 30th L304 *by* Kedington None Such G97.

3082 **V.**—Leckford Estate, Ltd., Stockbridge, for **Leckford Conny 3rd N882**, born July 1; *s.* Pakenham Sundial 1st K241, *d.* Leckford Constance 9th K930 *by* Tillington Highlander 7th G477.

3080 **R.N.**—T. F. James, Warren Farm, Culham, Abingdon, for **Treluckey Lady 35th.**
H.C.—3081. **C.**—3084, 3086.

Class 402.—*Large Black Sows, born in* 1936.

3106 **I.**—E. A. Warth, Upwood Hill House, Ramsey, Huntingdon, for **Pakenham Dauntless 3rd P184**, born Jan. 2, bred by D. W. P. Gough, Pakenham Manor, Bury St. Edmunds; *s.* Pakenham Sundial 10th M271, *d.* Thelveton Fearless 8th H1788 *by* Pakenham Rostrum G259.

3093 **II.**—Harry E. Bastard, Lemail, Wadebridge, for **Tinten Princess 44th P34**, born Jan. 5; *s.* Patshull Leader 18th M143, *d* Tinten Princess 39th L208 *by* Cornwood Imperialist G547.

3094 **III.**—Harry E. Bastard, for **Tinten Princess 45th P36**, born Jan. 5; *s.* Patshull Leader 18th M143, *d.* Tinten Princess 39th L208 *by* Cornwood Imperialist G547.

3091 **IV.**—W. J. Acreman, Langland Farm, Catcott, Bridgwater, for **Langland Black Bess 3rd P206**, born Feb. 1; *s.* Brent Hero 5th L287, *d.* Tinten Black Bess 74th M152 *by* Cornwood Imperialist G547.

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[1] Silver Challenge Cup, and Gold Medal to the Breeder, given by the Large Black Pig Society for the best Large Black Sow.

3100 **V.**—G. A. Goodchild, Great Yeldham Hall, Essex, for **Tartar Queen P** P220, born Jan. 8; *s.* Poncorse Enterprise L23, *d.* Tartar Queen N H1298 *by* Kedington None Such 3rd G293.

3092 **R.N.**—A. J. Baker, Comeytrowe Manor, Taunton, for **Dowhills Dolla.**
H.C.—3099, 3102. **C.**—3097, 3101.

3007, 3052, 3066 **Cup.**[1]—D. W. P. Gough, for **Tartar Talisman, Pakenham Fancy 7th** and **Pakenham Delicious.**

3012, 3045, 3061 **R.N. for Cup.**[1]—F. G. Alexander, for **Depwade Duke, Depwade Duchess 3rd** and **Depwade Duchess 6th.**

Gloucestershire Old Spots.

Class 403.—*Gloucestershire Old Spots Boars, born in or before* 1934.

3107 **I. & Champion.**[2]—S. C. Flook, Tynings Farm, Codrington, Chipping Sodbury, Glos., for **Chalfield Michael** 5980, born March 13, 1932, bred by Major R. F. Fuller, Great Chalfield, Melksham; *s.* Beara Michael 5867, *d.* Chalfield Blossom Z588 *by* Maiden Bradley Judge 2nd 5825.

3108 **II. & R.N. for Champion.**[2]—Henry Matthews, Winterbourne, Bristol, for **Winterbourne Edward** 6020, born June 10, 1934; *s.* Winterbourne Prince Edward 5947, *d.* Rodney Daisy 2nd Z541 *by* Earthcott Prince 5673.

Class 404.—*Gloucestershire Old Spots Boars, born in* 1935.[3]

3111 **I.**—Sherriff & Sons, Lemsford, Welwyn Garden, Herts., for **Nashes Duke 33rd** 6028, born Jan. 6; *s.* Nashes Duke 25th 5995, *d.* Nashes Duchess 55th Z749 *by* Hempstead Jim 17th 5888.

3112 **II.**—Sherriff & Sons, for **Nashes Duke 35th** 6041, born Oct. 6; *s.* Nashes Bruce 7th 5985, *d.* Nashes Blossom 30th Z737 *by* Hempstead Jim 17th 5888.

Class 405.—*Gloucestershire Old Spots Boars, born in* 1936.

3115 **I.**—Sherriff & Sons, Lemsford, Welwyn Garden, Herts., for **Nashes Duke 36th** 6050, born Jan. 5; *s.* Nashes Duke 31st 6022, *d.* Nashes Duchess 52nd Z634 *by* Pevensey Hero 5820.

3116 **II.**—Sherriff & Sons, for **Nashes Duke 37th** 6051, born Jan. 5; *s.* Nashes Duke 31st 6022, *d.* Nashes Duchess 52nd Z634 *by* Pevensey Hero 5820.

3113 **III.**—Bennett & Howard, Quarry Farm, Thornbury, Bristol, for **Thornbury Towser** 6048, born Feb. 28; *s.* Tyning Bob 6018, *d.* Thornbury Clear Z886 *by* Knowle Billy 5887.

3114 **R.N.**—Bennett & Howard, for **Thornbury Unicorn.**

Class 406.—*Gloucestershire Old Spots Breeding Sows, born in or before* 1934.

3120 **I., Champion**[4] **& Champion.**[5]—Sherriff & Sons, Lemsford, Welwyn Garden, Herts., for **Nashes Duchess 57th** Z811, born July 2, 1933, farrowed Jan. 14; *s.* Solihull Peter 5936, *d.* Nashes Duchess 52nd Z634 *by* Pevensey Hero 5820.

3117 **II.**—Bennett & Howard, Quarry Farm, Thornbury, Bristol, for **Thornbury Clear** Z886, born May 10, 1933, farrowed Feb. 28; *s.* Knowle Billy 5887, *d.* Solihull Josephine 12th Z605 *by* Holmwood Lillywhite 5869.

3121 **III.**—H. B. Shield, Alkington Farm, Berkeley, Glos., for **Solihull Bonetta 14th** Z883, born Oct. 7, 1934, farrowed April 27, bred by J. F. Wright, Olton Farm, Solihull; *s.* Nashes Duke 21st 5976, *d.* Solihull Bonetta Z385 *by* Maiden Bradley Submarine 2nd 5720.

3119 **R.N.**—Sherriff & Sons, for **Nashes Duchess 56th.**

Class 407.—*Gloucestershire Old Spots Sows, born in* 1935.

3125 **I., R.N. for Champion**[4] **& R.N. for Champion.**[5]—Sherriff & Sons, Lemsford, Welwyn Gardens, Herts., for **Nashes Duchess 60th** Z894, born July 5; *s.* Nashes Duke 25th 5995, *d.* Nashes Blossom 31st Z752 *by* Solihull Peter 5936.

3123 **II.**—Henry Matthews, Winterbourne, Bristol, for **Winterbourne Spot** Z868, born May 25; *s.* Winterbourne Prince Edward 5947, *d.* Rodney Daisy 4th Z543 *by* Eastcott Prince 5673.

3124 **III.**—Sherriff & Sons, for **Nashes Duchess 59th** Z847, born Jan. 6; *s.* Nashes Duke 25th 5995, *d.* Nashes Duchess 55th Z749 *by* Hempstead Jim 17th 5888.

3122 **R.N.**—S. C. Flook, Tynings Farm, Codrington, Chipping Sodbury, Glos., for **Tyning Cream 10th.**

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[1] The "Baydon" Silver Challenge Cup given through the Large Black Pig Society for the best Group consisting of one Boar from Classes 395, 396 or 397, one Breeding Sow from Class 399, and one Sow from Classes 399, 400 or 401.

[2] Silver Challenge Cup given through the Gloucestershire Old Spots Pig Society for the best Gloucestershire Old Spots Boar.

[3] Prizes given by the Gloucestershire Old Spots Pig Society.

[4] Perpetual Silver Challenge Cup given through the Gloucestershire Old Spots Pig Society for the best Gloucestershire Old Spots Sow.

[5] Perpetual Silver Challenge Cup given through the Gloucestershire Old Spots Pig Society for the best Gloucestershire Old Spots Pig.

Class 408.—*Gloucestershire Old Spots Sows, born in* 1936.

3129 I.—S. C. Flook, Tynings Farm, Codrington, Chipping Sodbury, Glos., for **Tyning May 1st** Z911, born Jan. 3; *s.* Nashes Duke 30th 6021, *d.* Tyning Lass Z888 *by* Northend Star 5962.
3130 II.—S. C. Flook, for **Tyning May 2nd** Z912, born Jan. 3; *s.* Nashes Duke 30th 6021, *d.* Tyning Lass Z888 *by* Northend Star 5962.
3132 III.—Sherriff & Sons, Lemsford, Welwyn Garden, Herts., for **Nashes Duchess 62nd** Z896, born Jan. 5; *s.* Nashes Duke 31st 6022, *d.* Nashes Duchess 52nd Z634 *by* Pevensey Hero 5820.

3131 R.N.—Sherriff & Sons, for **Nashes Duchess 61st.**
H.C.—3127. C.—3128.

Cumberlands.

Class 409.—*Cumberland Boars, born in or before* 1935.

3133 I.—Ralph Millner, Angerton, Kirkbride, Carlisle, for **Fairway Don Quixote** (M.L.N.Q.36), born Aug. 26, 1934; *s.* Greenspot Pride 9769, *d.* Fairway Doris 9727 *by* Greenspot Monarch 9015.

Class 410.—*Cumberland Boars, born in* 1936.

3137 I.—Robert Wilson, Dockrayrigg, Wigton, for **Lonning Squire** (G.H.L.S.1), born Jan. 3, bred by Henry L. Gardhouse, Lonning Farm, Wigton; *s.* Grinsdale Express, *d.* Lonning Queen 9973 *by* Laverock Admiral 9479.
3134 II.—Ralph Millner, Angerton, Kirkbride, Carlisle, for **Fairway Senator** (M.L.N.S.1), born Feb. 28; *s.* Fairway Don Quixote, *d.* Fairway Doris 9727 *by* Greenspot Monarch 9015.
3136 III.—Robert Wilson, for **Lonning Sergeant** (G.H.L.S.2), born Jan. 3, bred by Henry L. Gardhouse, Lonning Farm, Wigton; *s.* Grinsdale Express, *d.* Lonning Queen 9973 *by* Laverock Admiral 9479.
3135 R.N.—Ralph Millner, for **Fairway Sentinel.**

Class 411.—*Cumberland Sows, born in or before* 1935.

3138 I. & **Champion.**[1]—Ralph Millner, Angerton, Kirkbride, Carlisle, for **Fairway Doris** 9727 (M.L.N.N.86), born Sept. 2, 1931, farrowed Feb. 28; *s.* Greenspot Monarch 9015, *d.* Doris of Dolphenby 9205 *by* Wiggonrigg Jock 8590.
3139 II. & R.N. for **Champion.**[1]—Ralph Millner, for **Fairway Reenie** 10059 (M.L.N.R.63), born July 14, 1935; *s.* Greenspot Pride 9769, *d.* Fairway Opal 9989 *by* Greenspot Monarch 9015.

Class 412.—*Cumberland Sows, born in* 1936.

3140 I.—Henry L. Gardhouse, Lonning Farm, Wigton, for **Lonning Susie** (G.H.L.S.9), born Jan. 3; *s.* Grinsdale Express, *d.* Lonning Queen 9973 *by* Laverock Admiral 9479.
3141 II.—Ralph Millner, Angerton, Kirkbride, Carlisle, for **Fairway Sally** (M.L.N.S.25), born March 3; *s.* Fairway Don Quixote, *d.* Fairway Queenie *by* Greenspot Pride 9769.
3142 III.—Ralph Millner, for **Fairway Susie** (M.L.N.S.16), born Feb. 29; *s.* Fairway Don Quixote, *d.* Fairway Opal 9989 *by* Greenspot Monarch 9015.
3144 R.N.—Robert Wilson, Dockrayrigg, Wigton, for **Lonning Susan.**

Essex.

Class 413.—*Essex Boars, born in* 1935, *before July* 1.

3145 I.—Harold H. Bowser, Swineshead House, Boston, Lincs., for **Huskards Weeley Nevill 2nd** 4431 (786), born Jan. 26, bred by Mrs. Frank Hilder, Huskards, Ingatestone; *s.* Weeley Enterprise 16th 4139, *d.* Huskards Pipkin 19278 *by* Chantry Azurlite 2433.
3146 II.—W. Dennis & Sons, Ltd., Kirton, Boston, Lincs., for **Kirton Emblem** 4829 (986), born June 2; *s.* Trueloves Emblem 4355, *d.* Rickling Treasure 41st 23290 *by* Cressing Grand Duke 8th 3915.

Class 414.—*Essex Boars, born in* 1935, *on or after July* 1.

3154 I.—Tinney & Hitchcock, Church End Farm, Rickling, Newport, Essex, for **Roothing Dictator 4th** 4739 (941), born July 18, bred by W. Ritchie, Marks Hall, Margaret Roding, Essex; *s.* Bocking Dictator 4163, *d.* Roothing Female 6th 19676 *by* Peace Kaiser 3233.
3147 II.—A. Herbert Carter, Tydd Manor, Wisbech, for **Cressing Grand Duke 29th** 4643 (896), born July 2, bred by A. J. Cousins, Cressing Lodge, Braintree; *s.* Laver Peacock 3689, *d.* Cressing Grand Duchess 6th 20942 *by* Rickling Duke 5th 3637.

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[1] Silver Challenge Cup given by the Cumberland Pig Breeders' Association for the best Cumberland Pig.

3152 III.—W. Dennis & Sons, Ltd., Kirton, Boston, Lincs., for **Roothing Dictator 5th** 4741 (942), born July 20, bred by W. Ritchie, Marks Hall, Margaret Roding, Essex; *s.* Bocking Dictator 4163, *s.* Roothing Biddy 16th 21592 *by* Trueloves Atom 3847.

3153 R.N.—Mrs. Frank Hilder, Huskards, Ingatestone, Essex, for **Benton Chieftain.**
H.C.—3149.

Class 415.—*Essex Boars, born in* 1936.

3165 I.—Mrs. Frank Hilder, Huskards, Ingatestone, Essex, for **Huskards John 2nd** 4761 (951), born Jan. 9; *s.* Weeley Enterprise 16th 4139, *d.* Huskards Pipkin 5th 21494 *by* Cressing Grand Duke 9th 3949.

3158 II.—Harold H. Bowser, Swineshead House, Boston, Lincs., for **Magdalen Hero 11th** 4841 (992), born Jan. 8; *s.* Cressing Grand Duke 23rd 4199, *d.* Magdalen Pride 20th 22110 *by* Magdalen Hero 1st 4181.

3157 III.—Harold H. Bowser, for **Magdalen Hero 10th** 4839 (991), born Jan. 8; *s.* Cressing Grand Duke 23rd 4199, *d.* Magdalen Pride 26th 22652 *by* Magdalen Hero 1st 4181.

3159 IV.—A. Herbert Carter, Tydd Manor, Wisbech, for **Tydd Janitor** 4779 (964), born Jan. 1; *s.* Kirton Janitor 4th 4451, *d.* Kirton Fascination 2nd 23648 *by* Benton Barling 4149.

3156 R.N.—H. S. Ashton, Trueloves, Ingatestone, Essex, for **Trueloves Falcon.**
H.C.—3160.

Class 416.—*Essex Breeding Sows, born in or before* 1934.

3178 I. & Champion.[1]—W. Dennis & Sons, Ltd., Kirton, Boston, Lincs., for **Kirton Carrie** 21866 (2898) F.S., born Nov. 18, 1932, farrowed Feb. 2; *s.* Bocking Bouncer 3889.

3177 II.—W. Dennis & Sons, Ltd., for **Kirton Blanche** 21856 (2893) F.S., born Oct. 8, 1932, farrowed Jan. 12.

3182 III.—Tinney & Hitchcock, Church End Farm, Rickling, Newport, Essex, for **Rickling Pippin 3rd** 22558 (3242), born May 30, 1933, farrowed Jan. 28; *s.* Roothing Kaiser 5th 3681, *d.* Thorley Pippin 6th 21210 *by* Galleymac 2nd 3365.

3174 R.N.—A. Herbert Carter, Tydd Manor, Wisbech, for **Thorley Faithful 9th.**
H.C.—3171. C.—3176.

Class 417.—*Essex Sows, born in* 1935, *before July* 1.

3186 I. & R.N. for Champion.[1]—H. S. Ashton, Trueloves, Ingatestone, Essex, for **Trueloves Nina** 23518 (3723), born Jan. 8; *s.* Roothing Grand Duke 4213, *d.* Trueloves Eaves 22424 *by* Cherry of Trueloves 3679.

3193 II.—W. Dennis & Sons, Ltd., Kirton, Boston, Lincs., for **Trueloves Natalie** 24374 (4159), born Feb. 27, bred by H. S. Ashton, Trueloves, Ingatestone; *s.* Tanfield King 2nd 3973, *d.* Trueloves Babs 21980 *by* Cherry of Trueloves 3679.

3195 III.—Tinney & Hitchcock, Church End Farm, Rickling, Newport, Essex, for **Rickling Charlotte 56th** 24786 (4847), born Jan. 2; *s.* Cressing Grand Duke 24th 4201, *d.* Rickling Charlotte 29th 21750 *by* Roothing Kaiser 5th 3681.

3189 R.N.—A. Herbert Carter, Tydd Manor, Wisbech, for **Cressing Grand Duchess 32nd.**
H.C.—3192. C.—3188.

Class 418.—*Essex Sows, born in* 1935, *on or after July* 1.[2]

3197 I.—H. S. Ashton, Trueloves, Ingatestone, Essex, for **Trueloves Oddly** 25790 (4849), born July 5; *s.* Cherry of Trueloves 3679, *d.* Trueloves Chess 20782 *by* Barling Neptune 3261.

3201 II.—W. Dennis & Sons, Ltd., Kirton, Boston, Lincs., for **Kirton Amulet 9th** 25546 (4727), born July 3; *s.* Kirton Sultan 4363, *d.* Kirton Amulet 6th 22778 *by* Bocking Bouncer 3889.

3207 III.—Tinney & Hitchcock, Church End Farm, Rickling, Newport, Essex, for **Roothing Female 37th** 29554 (4931), born Aug. 20, bred by W. Ritchie, Marks Hall, Margaret Roding, Essex; *s.* Trueloves Eric 4353, *d.* Roothing Female 27th 23558 *by* Roothing Sultan 3rd 3983.

3200 R.N.—A. Herbert Carter, Tydd Manor, Wisbech, for **Huskards Weeley Dorothy.**
H.C.—3202. C.—3204.

Class 419.—*Essex Sows, born in* 1936.

3212 I.—Herbert H. Bowser, Swineshead House, Boston, Lincs., for **Magdalen Pride 4th** 25998 (4953), born Jan. 8; *s.* Cressing Grand Duke 23rd 4199, *d.* Magdalen Pride 20th 22110 *by* Magdalen Hero 1st 4181.

3223 II.—Wyndham T. Vint, Thorn Cottage, Wroot, Doncaster, for **Hatfield Abbess** 26080 (4994), born Jan. 1; *s.* Hatfield Atom 4465, *d.* Kirton Abbess 2nd 23418 *by* Hanningfield Janitor 3965.

3216 III.—W. Dennis & Sons, Ltd., Kirton, Boston, Lincs., for **Kirton Caroline 5th** 25554 (4731), born Jan. 4; *s.* Kirton Grand Duke 4241, *d.* Kirton Caroline 3rd 23452 *by* Hanningfield Janitor 3965.

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[1] Champion Silver Cup given by the Essex Pig Society for the best Essex Pig.

[2] Prizes given by the Essex Pig Society.

3214 IV.—A. HERBERT CARTER, Tydd Manor, Wisbech, for **Tydd Fascination** 25622 (4771), born Jan. 1; *s.* Kirton Janitor 4th 4451, *d.* Kirton Fascination 2nd 23648 *by* Bendon Barling 4149.

3217 V.—W. DENNIS & SONS, LTD., for **Kirton Carrie 4th** 25834 (4871), born Feb. 3; *s.* Kirton Grand Duke 4241, *d.* Kirton Carrie 2nd 23894 *by* Hanningfield Janitor 3905.

3211 **R.N.**—H. S. ASHTON, Trueloves, Ingatestone, Essex, for **Trueloves Fan.**

H.C.—3210. **C.**—3215.

3177, 3178, 3193 **Cup.**[1]—W. DENNIS & SONS, LTD., for **Kirton Blanche, Kirton Carrie** and **Trueloves Natalie.**

3171, 3186, 3197 **R.N. for Cup.**[1]—H. S. ASHTON, for **Trueloves Attract, Trueloves Nina** and **Trueloves Oddly.**

Long White Lop-Eared.

Class 420.—*Long White Lop-Eared Boars, born in or before* 1935.

3230 **I., Champion**[2] **& R.N. for Champion.**[3]—M. OTTON & SON, Fairfield, Morchard Bishop, Lapford, Devon, for **Afton Gay Boy 2nd** 2704, born Jan. 14, 1934, bred by J. H. Pearse & Son, Afton, Totnes; *s.* Clifford Michael 2514, *d.* Afton Beauty 7th 7487 *by* Yealmpstone Sambo 1796.

3225 II.—G. H. EUSTICE, Bezurrel, Gwinear, Hayle, for **Bezurrell Ben** 2832, born Oct. 2, 1934; *s.* Trolvis Ben 13th 2614, *d.* Bezurrell Mary 51st 7753 *by* Afton Gay Boy 1122.

3227 III.—H. R. JASPER, East Petherwin Farm, South Petherwin, Launceston, for **Yealmpstone Gay Boy 14th** 2848, born Jan. 13, 1935, bred by W. H. Neal, Walreddon Farm, Tavistock; *s.* Treringey Captain 2nd 2494, *d.* Petherwin No. 24 of 1933 7599 *by* Trolvis Ben 11th 2328.

3229 **R.N.**—W. H. NEAL, Walreddon Farm, Tavistock, for **Treringey Captain 2nd.**

Class 421.—*Long White Lop-Eared Boars, born in* 1936.

3231 **I. & R.N. for Champion.**[2]—G. H. EUSTICE, Bezurrel, Gwinear, Hayle, for **Bezurrell Ben 5th** 2922, born Jan. 2; *s.* Bezurrell Ben 2832, *d.* Bezurrell Mona 9th 6313 *by* Afton Gay Boy 1122.

3233 II.—H. R. JASPER, East Petherwin Farm, South Petherwin, Launceston, for **Petherwin Ringleader** 2920, born Feb. 3; *s.* Lumburn Lad 11th 2790, *d.* Lidcutt Vanity 6th 6761 *by* Lumburn Lad 5th 1732.

3234 III.—W. H. NEAL, Walreddon Farm, Tavistock, for **Luson Prefect 1st** 2944, born Jan. 16, bred by C. E. Harvey, Luson, Yealmpton; *s.* Wiverton Prince 1st 2618, *d.* Waye Empress No. 3 7423 *by* Holland Gay Boy 2336.

3232 **R.N.**—G. H. EUSTICE, for **Bezurrell Ben 7th.**

Class 422.—*Long White Lop-Eared Breeding Sows, born in or before* 1934.

3236 **I., Champion**[3] **& Champion.**[4]—G. H. EUSTICE, Bezurrel, Gwinear, Hayle, for **Bezurrell Ruby 2nd** 7065, born March 5, 1931, farrowed Jan. 6; *s.* Forest Pattern 1st 2204, *d.* Bezurrell Mary 7th 5241 *by* Afton Gay Boy 1122.

3240 II.—M. OTTON & SON, Fairfield, Morchard Bishop, Lapford, Devon, for **Paramount Princess 9th** 7131, born July 10, 1931, farrowed Jan. 29, bred by C. Marshall, Paramount View, Ivybridge; *s.* Paramount Superior 2nd 2194, *d.* Paramount Princess 4th 6105 *by* Priory Millman 7th 1216.

3237 III.—H. R. JASPER, East Petherwin Farm, South Petherwin, Launceston, for **Lidcutt Longsides 22nd** 7677, born Jan. 11, 1934, farrowed Jan. 20, bred by F. Richards, Bodmin; *s.* Paramount Duke 5th 2604, *d.* Lidcutt Vanity 15th 7389 *by* Trolvis Ben 11th 2328.

3241 **R.N.**—WILLIAM J. WESTLAKE, Godwell, Ivybridge, for **Godwell Duchess 2nd.**

H.C.—3239.

Class 423.—*Long White Lop-Eared Sows, born in* 1935.

3244 **I. & R.N. for Champion.**[4]—H. R. JASPER, East Petherwin Farm, South Petherwin, Launceston, for **Yealmpstone Dainty 8th** 8021, born Jan. 13, bred by W. H. Neal, Walreddon Farm, Tavistock; *s.* Treringey Captain 2nd 2494, *d.* Petherwin No. 24 of 1933 7599 *by* Trolvis Ben 11th 2328.

3247 II.—M. OTTON & SON, Fairfield, Morchard Bishop, Lapford, Devon, for **Godwell Duchess 6th** 7913, born Jan. 22, bred by W. J. Westlake, Godwell, Ivybridge; *s.* Godwell Admiral 2568, *d.* Godwell Duchess 2nd 7313 *by* Devonshire Sportsman 2108.

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[1] The "Sedgemere" Silver Challenge Cup given through the Essex Pig Society for the best Group of three Essex Pigs.

[2] Champion Silver Medal given by the National Long White Lop-Eared Pig Society for the best Boar.

[3] The "Risingholme" Silver Challenge Cup given through the National Long White Lop-Eared Pig Society for the best Long White Lop-Eared Pig.

[4] Champion Silver Medal given by the National Long White Lop-Eared Pig Society for the best Sow.

3246 III.—W. H. Neal, Walreddon Farm, Tavistock, for **Yealmpstone Dainty 10th 8025**, born Jan. 13 ; *s.* Treringey Captain 2nd 2494, *d.* Petherwin No. 24 of 1933 7599 *by* Trolvis Ben 11th 2328.

3245 **R.N.** -W. H. Neal, for **Yealmpstone Dainty 9th.**
H.C. 3248. **C.**--3242.

Class 424.—*Long White Lop-Eared Sows, born in* 1936.

3251 I. H. R. Jasper, East Petherwin Farm, South Petherwin, Launceston, for **Petherwin No. 1 of 1936** 8263, born Feb. 3 ; *s.* Lumburn Lad 11th 2790, *d.* Lidcutt Vanity 6th 6761 *by* Lumburn Lad 5th 1732.
3252 II.—W. H. Neal, Walreddon Farm, Tavistock, for **Yealmpstone No. 1** 8287, born Jan. 2 ; *s.* Treringey Captain 2nd 2494, *d.* Waye No. 4 of 1934 7883 *by* Petherwin Lad 1st 2550.
3249 III.—G. H. Eustice, Bezurrell, Gwinear, Hayle, for **Bezurrell Mona 37th** 8265, born Jan. 2 ; *s.* Bezurrell Ben 2832, *d.* Bezurrell Mona 9th, 6313 *by* Afton Gay Boy 1122.

3250 **R.N.**—G. H. Eustice, for **Bezurrell Ruby 13th.**
H.C.—3253.

Welsh.

Class 425.—*Welsh Boars, born in or before* 1935.

3255 I.—R. Ewart Owen, Tanlan Hall Home Farm, Prestatyn, for **Prestatyn Lancer 2nd** 334 (D.U. 120), born Sept, 3, 1935 ; *s.* Prestatyn Lancer 292, *d.* Prestatyn Flame 268 *by* Treveilyr Peter 58.
3254 II.—R. Ewart Owen, for **Prestatyn King** 265 (D.U. 30), born Jan. 15, 1934 ; *s.* Prestatyn Gay Boy 117, *d.* Prestatyn Lucy 8th 280 *by* Forest Pattern 17th 57.

Class 426.—*Welsh Boars, born in* 1936.

3258 I. - R. Ewart Owen, Tanlan Hall Home Farm, Prestatyn, for **Prestatyn Turk 1st** 350 (D.U. 140), born Jan. 1 ; *s.* Prestatyn Gay Boy 117, *d.* Welstor Ida 721 *by* Prestatyn Jock 212.
3261 II.—H. Williams, Chestnut Tree Farm, Whitson, Mon., for **Gwentland Royalist** (H.T. 85), born Jan. 7, bred by H. Tilney, Glasllwch Lane, Newport, Mon. ; *s.* Prestatyn Derwen 150, *d.* Dinam Healthful 165 *by* Peniel Premier 1st 44.
3259 III.—R. Ewart Owen, for **Prestatyn Turk 2nd** 351 (D.W. 141), born Jan. 1 ; *s.* Prestatyn Gay Boy 117, *d.* Welstor Ida 721 *by* Prestatyn Jock 212.

Class 427.—*Welsh Breeding Sows, born in or before* 1934.

3263 I.—R. Ewart Owen, Tanlan Hall Home Farm, Prestatyn, for **Prestatyn Lucy 19th** 343 (D.U. 72), born in Aug., 1932, farrowed Jan. 15 ; *s.* Treveilyr Peter 58, *d.* Hedog Lucy 81 *by* Penback Cymro 34.
3264 II.—Wyndham T. Vint, Thorn Cottage, Wroot, Doncaster, for **Dinam Impartial** 288 (B.U. 687), born Jan 2, 1933, farrowed March 1, bred by Dinam Estate Co., Plas Dinam, Llandinam, Mont. ; *s.* Forest Pattern 17th 57, *d.* Dinam Ethel 27 *by* Penback Cymro 4th 37.
3268 III.—H. Williams, Chestnut Tree Farm, Whitson, Mon., for **Gwentland Beauty 4th** 724 (H.T. 47), born Sept. 21, 1934, farrowed Jan. 10, bred by H. Tilney, Glasllwch Lane, Newport, Mon. ; *s.* Prestatyn Derwen 150, *d.* Dinam Harmonius 163 *by* Peniel Premier 1st 44.

3262 **R.N.**—R. Ewart Owen, for **Prestatyn Lucy 5th.**
H.C.—3265. **C.**—3267.

Class 428.—*Welsh Sows, born in* 1935.[1]

3260 I.--R. Ewart Owen, Tanlan Hall Home Farm, Prestatyn, for **Prestatyn Fancy 1st** 905 (D.U. 55), born Feb. 16 ; *s.* Prestatyn Lancer 292, *d.* Prestatyn Flame 268 *by* Treveilyr Peter 58.
3270 II.—R. Ewart Owen, for **Prestatyn Fancy 2nd** 906 (D.U. 56), born Feb. 16 ; *s.* Prestatyn Lancer 292, *d.* Prestatyn Flame 268 *by* Treveilyr Peter 58.
3271 III.—W. Whitley, Barton Pines, Paignton, for **Welstor Infanta** 885 (140), born Aug. 4 ; *s.* Prestatyn Jock 212, *d.* Welstor Hesse 508 *by* Trergof Fusilier 68.

3272 **R.N.**—W. Whitley, for **Welstor Ira.**

Class 429.—*Welsh Sows, born in* 1936.

3273 I.—R. Ewart Owen, Tanlan Hall Home Farm, Prestatyn, for **Prestatyn Ida 1st** 907 (D.U. 144), born Jan. 1 ; *s.* Prestatyn Gay Boy 117, *d.* Welstor Ida 721 *by* Prestatyn Jock 212.
3280 II.—H. Williams, Chestnut Tree Farm, Whitson, Mon., for **Gwentland Jean 6th** 909 (H.T. 81), born Jan. 4, bred by H. Tilney, Glasllwch Lane, Newport, Mon. ; *s.* Prestatyn Derwen 150, *d.* Dinam Harmonious 163 *by* Peniel Premier 1st 44.
3277 III.—Wyndham T. Vint, Thorn Cottage, Wroot, Doncaster, for **Emlyn Fairy 4th** 926 (V.T. 217), born Jan. 11 ; *s.* Prestatyn Gay Boy 6th 147, *d.* Prestatyn Fairy 2nd 476 *by* Prestatyn Derwen 146.

3276 **R.N.**—Wyndham T. Vint, for **Emlyn Fairy 2nd.**
H.C.—3274, 3275, 3278, 3279.

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[1] Prizes given by the Welsh Pig Society.

POULTRY.

By "Cock" and "Hen" are meant birds hatched previous to November 1, 1935; and by "Cockerel" and "Pullet" are meant birds hatched on or after November 1, 1935.

The Prizes in each Class are as follows: **First Prize, 30s.; Second Prize, 20s.; Third Prize, 10s.; Fourth Prize, 5s.**

Special Prizes were given in the Poultry Classes by the following Clubs: Croad Langshan, Sussex, Columbian Wyandotte, Buff Orpington, British Jersey Giant, British Black Barnevelder, British Barnevelder, Rhode Island Red, Plymouth Rock, Silkie, Welsummer and Buff Plymouth Rock.

"P.F." stands for "Poultry Farm."

Class 430.—*Dorking Cocks or Cockerels.*

4 I.—Sir Duncan Watson, Homelea P.F., Leigh Green, Reigate.
2 II. & 5 IV.—A. J. Major, Ditton, Langley, Bucks.
3 III.—Samuel Oatey, Chacewater, Truro.

1 R.N.—V. A. Bayley, Massey Farm, Upper Millichope, Church Stretton.

Class 431.—*Dorking Hens or Pullets.*

8 I.—Samuel Oatey, Chacewater, Truro.
10 II. & 7 IV.—A. J. Major, Ditton, Langley, Bucks.
9 III.—John & William Walker, Skinners Steps, Cupar, Fife.

6 R.N.—V. A. Bayley, Massey Farm, Upper Millichope, Church Stretton.

Class 432.—*Croad Langshan Cocks or Cockerels.*

11 I. & Special.—Sir Duncan Watson, Homelea P.F., Leigh Green, Reigate.
20 II. & R.N. for Special.—E. T. Poultney, Ivy Lodge, Cromhall, Glos.
14 III.—Harold Church, Godshill, Fordingbridge, Hants.
15 IV.—E. J. Taunton, Harnham Hollows, Salisbury.

16 R.N.—C. F. Barker, 51, Waverley, Brays Lane, Coventry.
H.C.—18. C.—22.

Class 433.—*Croad Langshan Hens or Pullets.*

26 I. & Special.—C. F. Barker, 51, Waverley, Brays Lane, Coventry.
32 II. & R.N. for Special.—E. J. Taunton, Harnham Hollows, Salisbury.
23 III.—George Beech, 220, Nantwich Road, Crewe.
30 IV.—Thomas Richards, 17, Church Street, Loanhead, Midlothian.

24 R.N.—Harold Church, Godshill, Fordingbridge, Hants.
H.C.—29. C.—25.

Class 434.—*Brahma or Cochin Cocks or Cockerels.*

37 I.—H. Whitley, Primley, Paignton.
35 II.—William Kean, Willow Bank, Middleton, Lancs.
34 III.—A. B. Memmory, Littleover Prize Farm, Derby.
38 IV.—R. M. Thomas, 1, Glasfryn, Cockett, Sketty, Swansea.

Class 435.—*Brahma or Cochin Hens or Pullets.*

44 I.—William Kean, Willow Bank, Middleton, Lancs.
40 II.—H. Whitley, Primley, Paignton.
42 III.—R. M. Thomas, 1, Glasfryn, Cockett, Sketty, Swansea.
43 IV.—H. Hough-Watson, Braystones House, Beckermet.

39 R.N.—A. B. Memmory, Littleover Prize Farm, Derby.
H C.—41.

Class 438.—*Light Sussex Cocks.*

47 I. & R.N. for Cup.[1]—Sir Duncan Watson, Homelea P.F., Leigh Green, Reigate.
46 II.—H. Underwood & Son, Mowshurst P.F., Edenbridge.
48 III.—Mrs. A. E. Jenkins, Wherwell P.F., Longparish, Hants.
45 IV.—Lord Kemsley, Pendley Stock Farms, Tring.

Class 439.—*Light Sussex Hens.*

50 I. & Cup[1] & 55 II.—Lord Kemsley, Pendley Stock Farms, Tring.
53 III.—Edmund Holt, The Limes, Pulford, Wrexham.
56 IV.—H. Underwood & Son, Mowshurst P.F., Edenbridge.

52 R.N.—F. R. Coleman, Whitmoor House, Ashill, Craddock, Uffculme.
H.C.—51. C.—54.

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[1] The "Crawshay Memorial" Cup given through the Sussex Poultry Club for the best Light Sussex.

Class 440.—*Light Sussex Cockerels.*

57 I.—Col. D. A. Chaytor, Pooley Hall, Polesworth, Tamworth.
60 II.—H. Underwood & Son, Mowshurst P.F., Edenbridge.
58 III. & 64 IV.—Lord Kemsley, Pendley Stock Farms, Tring.
62 R.N.—Mrs. A. E. Jenkins, Wherwell P.F., Longparish, Hants.
H.C.—65. C.—59.

Class 441.—*Light Sussex Pullets.*

67 I—Col. D. A. Chaytor, Pooley Hall, Polesworth, Tamworth.
66 II. & 71 R.N.—Lord Kemsley, Pendley Stock Farms, Tring.
73 III. & 68 IV.—H. Underwood & Son, Mowshurst P.F., Edenbridge.
H.C.—70. C.—69.

Class 442.—*Speckled Sussex Cocks.*

74 I., 76 II. & 77 III.—Lord Kemsley, Pendley Stock Farms, Tring.
75 IV.—Mrs. A. L. Tee, Hiltonbury, Denmead, Portsmouth.

Class 443.—*Speckled Sussex Hens.*

79 I., 80 II. & 81 III.—Lord Kemsley, Pendley Stock Farms, Tring.

Class 444.—*Speckled Sussex Cockerels.*

83 I., 85 II. & 84 III.—Lord Kemsley, Pendley Stock Farms, Tring.

Class 445.—*Speckled Sussex Pullets.*

89 I., 87 II. & 88 III.—Lord Kemsley, Pendley Stock Farms, Tring.

Class 448.—*White Wyandotte Cocks or Cockerels.*

95 I.—Sir Duncan Watson, Homelea P.F., Leigh Green, Reigate.
92 II.—W. J. Slade, No. 1 Riverside Cottage, Sidbury, Sidmouth.
91 III. & 94 IV.—Hugh Gunn, Mayfield, Churchdown, Glos.
93 R.N.—Edmund Holt, The Limes, Pulford, Wrexham.

Class 449.—*White Wyandotte Hens or Pullets.*

100 I. & 96 II.—Hugh Gunn, Mayfield, Churchdown, Glos.
98 III.—Sir Duncan Watson, Homelea P.F., Leigh Green, Reigate.
97 IV.—G. A. Cole, Sidbury Mills, Sidmouth.
99 R.N.—The Rev. J. H. Peall, St. Richards, Slindon, Sussex.

Class 450.—*Columbian Wyandotte Cocks or Cockerels.*

102 I. & Cup.[1]—R. Matterface, 121, South Street, Bridport.
103 II. & 101 III.—Fred Brown, Woodside, Grimscar, Huddersfield.

Class 451.—*Columbian Wyandotte Hens or Pullets.*

107 I., R.N. for Cup[1] & Spoon,[1] & 105 III.—Fred Brown, Woodside, Grimscar, Huddersfield.
106 II. & R.N. for Spoon.[1]—R. Matterface, 121, South Street, Bridport.

Class 452.—*Gold or Silver Laced Wyandotte Cocks or Cockerels.*

112 I.—N. J. Thomas, Harvose, Grampound, Cornwall.
110 II. & 113 III.—Herbert Spensley, Oaks Farm, Menston-in-Wharfedale.
111 IV.—William Morgan, Balcurvie, Windygates, Fife.

Class 453.—*Gold or Silver Laced Wyandotte Hens or Pullets.*

121 I. & 116 R.N.—Herbert Spensley, Oaks Farm, Menston-in-Wharfedale.
120 II.—Miss E. T. Longe, Abbot's Hall, Stowmarket.
118 III.—Chas. Hargreaves, Cow Hey Farm, Great Harwood, Blackburn.
117 IV.—M. Broughton, Meadowside, Lacey Green, Wilmslow.
H.C.—115. C.—119.

Class 454.—*Wyandotte Cocks or Cockerels, any other colour.*

127 I.—Roger Hargreaves, Abbeydene P.F., Whalley, Lancs.
124 II.—Alex. E. Argo, Bructor, Inverurie.
122 III.—J. Carlton Hunting, Pankridge Farm, Prestwood, Great Missenden.

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[1] The "Goddard" Visiting Cup given by the Columbian Wyandotte Club for the best Columbian Wyandotte, and Silver Spoon for the best Columbian Wyandotte of opposite sex.

Class 455.—*Wyandotte Hens or Pullets, any other colour.*

132 I.—John Wharton, Honeycott Farm, Hawes, Yorks.
131 II.—Roger Hargreaves, Abbeydene P.F., Whalley, Lancs.

Class 456.—*Buff Orpington Cocks or Cockerels.*

133 I. & Special & 136 IV.—W. J. Golding, Bowens, Penshurst.
134 II.—J. A. Taylor, Wheatsheaf Cottage, Four Marks, Alton.
135 III.—George Rogers, 51, Globe Road, Romford.

Class 457.—*Buff Orpington Hens or Pullets.*

141 I. & R.N. for Special & 138 II.—W. J. Golding, Bowens, Penshurst.
139 III.—J. D. Orr, Gargunnock, by Stirling.
140 IV.—J. A. Taylor, Wheatsheaf Cottage, Four Marks, Alton.

137 R.N.—George Rogers, 51, Globe Road, Romford.

Class 458.—*Black Orpington Cocks or Cockerels.*

143 I. & 146 III.—John Burdett, 1, Lake Bank Terrace, Wingate.
144 II.—Sir Duncan Watson, Homelea P.F., Leigh Green, Reigate.
142 IV.—Miss Shanks, Stetchworth, Newmarket.

147 R.N.—J. D. Orr, Gargunnock, by Stirling.
H.C.—145.

Class 459.—*Black Orpington Hens or Pullets.*

152 I.—Fred Swindells, Diglake Farm, Buglawton, Cheshire.
153 II. & 150 III.—John Burdett, 1, Lake Bank Terrace, Wingate.
149 IV.—A. B. Memmory, Littleover Prize Farm, Derby.

Class 460.—*Orpington Cocks or Cockerels, any other colour.*

155 I. & 160 II.—Wild Bros., Abbey P.F., Kidwelly.
157 III.—J. D. Orr, Gargunnock, by Stirling.
156 IV.—W. G. Vivian & Son, 5, Stanhope Square, Holsworthy.

161 R.N.—Tom Trigg, The Oaks, Anthill, Denmead, Cosham.
H.C.—154. C.—158.

Class 461.—*Orpington Hens or Pullets, any other colour.*

167 I.—Wild Bros., Abbey P.F., Kidwelly.
164 II. & 168 III.—Tom Trigg, The Oaks, Anthill, Denmead, Cosham.
165 IV.—J. D. Kay, Stetchworth, Newmarket.

166 R.N.—H. Whitley, Primley, Paignton.

Class 463.—*British Jersey Giant Black or White Hens or Pullets.*

171 I. & Special.—James Cowans, Deneville, Wooler.
170 II. & R.N. for Special.—W. G. Vivian & Son, 5, Stanhope Square, Holsworthy.
172 III. & 169 IV.—Mrs. Allen, Newton Hall, Gargrave, Skipton.

Class 464.—*Black Barnevelder Cocks or Cockerels.*

180 I. & Special.—Harry Fox, International Poultry Yards, Matlock.
175 II. & R.N. for Special & 178 III.—Walter C. Payne, The Chalet, Weston, Hitchin.
174 IV.—Tom Clough, The P.F., Gawsworth, Macclesfield.

176 R.N.—E. A. Russell, The Grange, Sewardstone Road, Waltham Abbey.
H.C.—179. C —173.

Class 465.—*Black Barnevelder Hens or Pullets.*

183 I. & Special.—Tom Clough, The P.F., Gawsworth, Macclesfield.
187 II. & R.N. for Special.—Harry Fox, International Poultry Yards, Matlock.
184 III. & 182 R.N.—E. A. Russell, The Grange, Sewardstone Road, Waltham Abbey.
185 IV.—Walter C. Payne, The Chalet, Weston, Hitchin.

H.C.—186.

Class 466.—*Barnevelder Cocks or Cockerels, any other colour.*

188 I. & Special.—John Nelson, Jun., Stones House, Todmorden.
191 II. & R.N. for Special.—B. C. Leather, Maiden Bradley, Frome.
192 III.—Arthur Snowden, Clayton Hall P.F., Cross Hills, Keighley.
190 IV.—Miss A. C. H. Crewe, Corfe House, Taunton.

Class 467.—*Barnevelder Hens or Pullets, any other colour.*

193 I.—J. E. H. & Miss Venning, Trefrank, St. Clether, Launceston.
197 II.—B. C. Leather, Maiden Bradley, Frome.
195 III.—Arthur Snowden, Clayton Hall P.F., Cross Hills, Keighley.
194 IV.—Miss A. C. H. Crewe, Corfe House, Taunton.

Class 468.—*Rhode Island Red Cocks.*

202 I. & Special.—Frank H. Page, Woodlands, Great Horkesley, Colchester.
200 II.—J. G. Williamson, 4, Chester Road, Middlewich.
203 III.—G. H. Muzzlewhite, Redlands, Tavistock.
201 IV.—Richard Moore, The Orchards, Long Sutton, Wisbech.

199 R.N.—Lord Greenway, Stanbridge Earls P.F., Edenbridge.
H.C.—207. C—208.

Class 469.—*Rhode Island Red Hens.*

211 I. & R.N. for Special.—J. G. Williamson, 4, Chester Road, Middlewich.
216 II.—Richard Moore, The Orchards, Long Sutton, Wisbech.
210 III.—H. Broom, The Clink, Bridgwater.
215 IV.—A. F. M. Stevenson, Woodhouse Farm, Avening, Stroud.

217 R.N.—Charles R. Lucas, Kittle, Bishopston, Swansea.

Class 470.—*Rhode Island Red Cockerels.*

221 I. & R.N. for Special.—Frank H. Page, Woodlands, Great Horkesley, Colchester.
218 II.—Lord Greenway, Stanbridge Earls P.F., Edenbridge.
223 III.—G. H. Muzzlewhite, Redlands, Tavistock.
222 IV.—Edmund Holt, The Limes, Pulford, Wrexham.

219 R.N.—Richard Moore, The Orchards, Long Sutton, Wisbech.
H.C.—224.

Class 471.—*Rhode Island Red Pullets.*

232 I. & Special.—Norman H. Kettlewell, Lodway, Easton-in-Gordand, Bristol.
227 II.—Frank H. Page, Woodlands, Great Horkesley, Colchester.
230 III.—Richard Moore, The Orchards, Long Sutton, Wisbech.
234 IV.—J. H. Norman, Burrow, Wootton Courtenay, Minehead.

226 R.N.—Lord Greenway, Stanbridge Earls P.F., Edenbridge.
H.C.—231. C.—233.

Class 472.—*Barred Plymouth Rock Cocks.*

239 I.—W. W. W. Butt, Eastfield P.F., North Thoresby, Lincs.
236 II. & 241 IV.—Herbert Garlick, Kirkby Lonsdale.
237 III.—William Slater, c/o E. W. Allenby, Three Oaks, Virginia Water.

240 R.N.—Henry Bickerstaff, Hornby Hall, Lancaster.
H.C.—235.

Class 473.—*Barred Plymouth Rock Hens.*

243 I. & Special.—W. W. W. Butt, Eastfield P.F., North Thoresby, Lincs.
242 II. & 246 III.—E. W. Allenby, Three Oaks, Virginia Water.
244 IV.—Kenneth Bell, Holmbrook, Cumberland.

Class 474.—*Barred Plymouth Rock Cockerels.*

248 I.—W. W. W. Butt, Eastfield P.F., North Thoresby, Lincs.
251 II.—William Slater, c/o E. W. Allenby, Three Oaks, Virginia Water.
250 III.—Herbert Garlick, Kirkby Lonsdale.

249 IV. & 253 R.N.—F. H. Hayton, Levensfield, Silverdale, Lancs.

Class 475.—*Barred Plymouth Rock Pullets.*

256 I. & R.N. for Special.—J. Fawcett, Eldron House, Ingleton, Carnforth.
257 II.—W. W. W. Butt, Eastfield P.F., North Thoresby, Lincs.
255 III. & 258 IV.—Tom Garlick, Crag Bank, Carnforth.

Class 477.—*Buff Plymouth Rock Hens or Pullets.*

259 I. & Special.—James Bateman, Longcroft, Milnthorpe.
262 II & R.N. for Special.—Bilsborough & Bland, Park Lane P.F., Forton, Preston.
260 III.—W. W. W. Butt, Eastfield P.F., North Thoresby, Lincs.
263 IV.—J. D. Orr, Gargunnock, by Stirling.

261 R.N.—Geo. Mason & Son, 62, Main Street, Sedbergh.
C.—265.

Class 479.—*Plymouth Rock Hens or Pullets, any other colour.*

266 I. & Special.—Sir Duncan Watson, Homelea P.F., Leigh Green, Reigate.
267 II. & R.N. for Special.—E. W. Allenby, Three Oaks, Virginia Water.
268 III.—F. W. Rowlinson, Royston Road, Whittlesford, Cambridge.
269 IV.—J. D. Orr, Gargunnock, by Stirling.

Class 480.—*Old English Game Black-red Cocks or Cockerels.*

273 I.—Joseph Jones, 4, Cynon Row, Trecynon, Aberdare.
270 II.—Wilson Butler, Glebelands, Broughton-in-Furness.
274 III.—Stan Butler, 16, Blaencuffin Road, Llanhilleth, Mon.
275 IV.—T. Smith, Ivy Cottage, The Downs, Ross-on-Wye.
272 R.N.—John Oliver & Son, Threepwood Farm, Haydon Bridge.

Class 481.—*Old English Game Clay or Wheaten Hens or Pullets.*

284 I.—J. H. Baker & Son, Windyash, Barnstaple.
276 II.—H. E. Douglas, Church Street, Broughton-in-Furness.
283 III.—H. Hough-Watson, Braystones House, Beckermet.
280 IV.—Stan Butler, 16, Blaencuffin Road, Llanhilleth, Mon.
278 R.N.—Wilson Butler, Glebelands, Broughton-in-Furness.
H.C.—281. C.—279.

Class 482.—*Old English Game Cocks or Cockerels, any other colour.*

289 I.—H. Whitley, Primley, Paignton.
294 II.—H. Hough-Watson, Braystones House, Beckermet.
291 III.—J. H. Baker & Son, Windyash, Barnstaple.
299 IV.—H. J. Bale, Virginia Water.
288 R.N.—A. J. Major, Ditton, Langley, Bucks.
H.C.—296. C.—300.

Class 483.—*Old English Game Hens or Pullets, any other colour.*

304 I.—E. Stanley Webb, Pontvaen, Hay, Hereford.
306 II.—John Morgan & Sons, Brynamlwg, Derwen Road, Ystradgynlais, Swansea.
301 III.—J. H. Baker & Son, Windyash, Barnstaple.
303 IV.—H. Whitley, Primley, Paignton.
305 R.N.—H. Hough-Watson, Braystones House, Beckermet.
H.C.—307. C.—302.

Class 484.—*Indian Game Cocks or Cockerels.*

311 I.—J. H. Baker & Son, Windyash, Barnstaple.
312 II. & 308 III.—W. W. Whiteman, Abbots Lodge, Sandhurst, Gloucester.
309 IV.—W. E. Platten, Hill Farm, Little Ryburgh, Fakenham.

Class 485.—*Indian Game Hens or Pullets.*

315 I.—J. H. Baker & Son, Windyash, Barnstaple.
316 II.—W. E. Platten, Hill Farm, Little Ryburgh, Fakenham.

Class 486.—*Faverolles Cocks or Cockerels.*

320 I.—W. W. W. Butt, Eastfield P.F., North Thoresby, Lincs.
318 II. & 322 R.N.—H. W. Biddlecombe, Prestberries, Hartpury, Gloucester.
325 III.—Mrs. H. A. Clive, The Mill House, Hartpury, Gloucester.
323 IV.—C. H. Bradley, Tibberton, Gloucester.
H.C.—321.

Class 487.—*Faverolles Hens or Pullets.*

329 I.—Mrs. H. A. Clive, The Mill House, Hartpury, Gloucester.
327 II.—A. B. Memmory, Littleover Prize Farm, Derby.
334 III. & 330 IV.—C. H. Bradley, Tibberton, Gloucester.
328 R.N.—H. W. Biddlecombe, Prestberries, Hartpury, Gloucester.
H.C.—332. C.—333.

Class 488.—*Minorca Cocks or Cockerels.*

335 I.—W. S. Dando, Pensford, Bristol.
336 II.—Frank C. Tozer, 4, Broadway Road, Kingsteignton, Newton Abbot.
337 III.—Goodman Bros., 10, Quantock Terrace, Bridgwater.
339 IV.—A. G. F. Pitts, Alvechurch, Birmingham.

Class 489.—*Minorca Hens or Pullets.*

340 I.—JAMES ANDERSON, Kirkhall, Ardrossan, Ayrshire.
343 II.—SIR DUNCAN WATSON, Homelea P.F., Leigh Green, Reigate.
341 III. & 344 IV.—GOODMAN BROS., 10, Quantock Terrace, Bridgwater.

Class 490.—*Leghorn Cocks or Cockerels.*

345 I.—ROBERT MCPHERSON, Drumboy, Drumclog, Strathaven.
347 II.—TOM WALLS, The Looe, Ewell, Surrey.
348 III.—R. W. KEEN, The Factory, Castle Eden.

346 IV. & 349 R.N.—OVALTINE P.F., Kings Langley, Herts.

Class 492.—*Ancona Cocks or Cockerels.*

350 I.—ANDREW SOUTHERIN, 88, Burnley Road, Padiham.
353 II.—J. H. BAKER & SON, Windyash, Barnstaple.
351 III.—EDMUND HOLT, The Limes, Pulford, Wrexham.
352 IV.—DAVID I. THOMAS, 14, Twynyrefail Place, Gwaun-cae-Gurwen, Ammanford.

Class 493.—*Ancona Hens or Pullets.*

355 I.—ANDREW SOUTHERIN, 88, Burnley Road, Padiham.
354 II.—EDMUND HOLT, The Limes, Pulford, Wrexham.
357 III.—E. A. STEPHENS, Place, Portscatho, Cornwall.
356 IV.—J. H. BAKER & SON, Windyash, Barnstaple.

358 R.N.—FREDERICK SCOTT, West Garth, Arnside, Carnforth.

Class 494.—*White Silkie Cocks or Cockerels.*

359 I. & Special.—H. HOUGH-WATSON, Braystones House, Beckermet.
360 II.—ROBERT L. FAIRLEY, Lahana, Barnton, Midlothian.
361 III.—MRS. A. M. HALL, The Gables, Ruyton-XI-Towns, Shrewsbury.
362 IV.—MRS. E. S. FENTIMAN, Haldon, 186, Whitworth Road, Swindon.

Class 495.—*White Silkie Hens or Pullets.*

366 I. & R.N. for Special.—H. HOUGH-WATSON, Braystones House, Beckermet.
363 II.—MRS. A. M. HALL, The Gables, Ruyton-XI-Towns, Shrewsbury.
364 III.—ROBERT L. FAIRLEY, Lahana, Barnton, Midlothian.
365 IV.—MRS. E. S. FENTIMAN, Haldon, 186, Whitworth Road, Swindon.

Class 496.—*Silkie Cocks or Cockerels, any other colour.*

368 I. & 371 III. & R.N. for Special.—DAVID DRAPER, 99, Boundary Road, London, N.W.8.
370 II.—MRS. E. S. FENTIMAN, Haldon, 186, Whitworth Road, Swindon.
369 IV.—MRS. A. M. HALL, The Gables, Ruyton-XI-Towns, Shrewsbury.

367 R.N.—W. G. VIVIAN & SON, 5, Stanhope Square, Holsworthy.

Class 497.—*Silkie Hens or Pullets, any other colour.*

375 I. & Special.—DAVID DRAPER, 99, Boundary Road, London, N.W.8.
372 II.—ROBERT L. FAIRLEY, Lahana, Barnton, Midlothian.
374 III.—MRS. A. M. HALL, The Gables, Ruyton-XI-Towns, Shrewsbury.
373 IV.—MRS. E. S. FENTIMAN, Haldon, 186, Whitworth Road, Swindon.

Class 498.—*Cocks, any other distinct variety, except Bantams.*

380 I.—SIR DUNCAN WATSON, Homelea P.F., Leigh Green, Reigate. Hamburgh.
381 II.—H. HOUGH-WATSON, Braystones House, Beckermet. Polish.
382 III.—G. FIRTH, 10, Straits Lane, Read, Burnley. Modern Game.
383 IV.—J. PICKERILL, Moorside, Madeley, Staffs. Langshan.

377 R.N.—E. W. ALLENBY, Three Oaks, Virginia Water. Scots Grey.
H.C.—384. C.—378.

Class 499.—*Hens, any other distinct variety, except Bantams.*

392 I.—CHAS. HARGREAVES, Cow Hey Farm, Great Harwood, Blackburn. Andalusian.
387 II.—H. HOUGH-WATSON, Braystones House, Beckermet. Polish.
390 III.—G. FIRTH, 10, Straits Lane, Read, Burnley. Modern Game.
388 IV.—J. PICKERILL, Moorside, Madeley, Staffs. Langshan.

385 R.N.—JOHN AYRTON, Brighouse, Yorks. Langshan.
H.C.—391. C.—389.

Class 501.—*Pullets, any other distinct variety, except Bantams.*

397 I.—H. HOUGH-WATSON, Braystones House, Beckermet. Polish.
393 II.—J. PICKERILL, Moorside, Madeley, Staffs. Langshan.
394 III.—MAJOR G. T. WILLIAMS, Tredrea, Perranwell, Cornwall. Frizzle.
395 IV.—J. H. BAKER & SON, Windyash, Barnstaple.

Class 502.—*Utility Sussex Cocks or Cockerels.*

406 I.—Hugh Gunn, Mayfields, Churchdown, Glos.
404 II. & 399 IV.—Lord Kemsley, Pendley Stock Farms, Tring.
407 III.—Mrs. E. A. Jenkins, Wherwell P.F., Longparish, Hants.
408 R.N.—Lees Platt, Manchester Road, Mossley, Manchester.
H.C.—405. C.—398.

Class 503.—*Utility Sussex Hens or Pullets.*

415 I.—F. R. Coleman, Whitmoor House, Ashill, Craddock, Uffculme.
409 II. & 416 IV.—Lord Kemsley, Pendley Stock Farms, Tring.
417 III.—French & Meikle, Harrismith, Birchwood Road, Wilmington, Dartford.
412 R.N.—H. Underwood & Son, Mowshurst P.F., Edenbridge.
H.C.—410. C.—418.

Class 504.—*Utility Rhode Island Red Cocks or Cockerels.*

426 I. & Special.—Chas. Morgan, Rectory View, Portskewett, Chepstow.
431 II.—J. H. Edwards, Staplegrove House P.F., Staplegrove, Taunton.
424 III.—J. G. Williamson, 4, Chester Road, Middlewich.
435 IV.—G. Exelby, 97, Poppleton Road, York.
429 R.N.—Frank H. Page, Woodlands, Great Horkesley, Colchester.
H.C.—421. C.—419.

Class 505.—*Utility Rhode Island Red Hens or Pullets.*

445 I. & R.N. for Special.—Richard Moore, The Orchards, Long Sutton, Wisbech.
440 II.—Arthur Snowden, Clayton Hall P.F., Cross Hills, Keighley.
446 III.—Norman H. Kettlewell, Lodway, Easton-in-Gordano, Bristol.
447 IV.—C. J. Collier, Upper Boarspit, West Cross, Swansea.
442 R.N.—Philip E. Clarke, Loanda House, Doran's Hill, Newry, Northern Ireland.
H.C.—437.

Class 508.—*Utility Leghorn Cocks or Cockerels, any other colour than White.*

450 I.—Lee & Drake, 32, Pyenot Terrace, Cleckheaton.
452 II.—Robert McPherson, Drumboy, Drumclog, Strathaven.
455 III.—Austen Walker, Morton, Fiskerton, Notts.
451 IV.—George Rogers, 51, Globe Road, Romford.
454 R.N.—Harry Fox, International Poultry Yards, Matlock.

Class 509.—*Utility Leghorn Hens or Pullets, any other colour than White.*

459 I.—S. W. Hopkinson, Alton P.F., Alton, Tupton, Chesterfield.
460 II.—George Rogers, 51, Globe Road, Romford.
456 III. & 461 R.N.—J. W. Richardson, Eastfield P.F., Earsdon, Northumberland.
458 IV.—J. H. Baker & Son, Windyash, Barnstaple.

Class 510.—*Utility Welsummer Cocks or Cockerels.*

465 I., Special & Cup.—Arthur Snowden, Clayton Hall P.F., Cross Hills, Keighley.
464 II., R.N. for Special & R.N. for Cup.—John Nelson, Jun., Stones House, Todmorden.
466 III.—Mrs. Beatrice Hambly, Red House, Brixton, Devon.
469 IV.—H. W. Skinner, Beanacre Farm, Melksham, Wilts.
470 R.N.—J. D. Orr, Gargunnock, by Stirling.
H.C.—467. C.—468.

Class 511.—*Utility Welsummer Hens or Pullets.*

476 I., Special & Cup.—Roger Hargreaves, Abbeydene P.F., Whalley, Lancs.
484 II., R.N. for Special & R.N. for Cup.—F. A. Coles, Kilmersdon, Bath.
478 III.—J. D. Orr, Gargunnock, by Stirling.
474 IV.—John Nelson, Jun., Stones House, Todmorden.
480 R.N.—D. & K. Clements, Bricklands Stock Farm, Nailsea, Somerset.
H.C.—483. C.—485.

Class 512.—*Utility Australorp Cocks or Cockerels.*

491 I.—T. B. Clarkson, Bond's P.F., Pilling, Preston.
492 II.—F. J. Cheshire, 22, Wharf Road, Grantham.
486 III.—J. H. Baker & Son, Windyash, Barnstaple.
487 IV.—J. E. H. & Miss Venning, Trefrank, St. Clether, Launceston.
490 R.N.—J. H. Beever, Wansford, Driffield.
H.C.—489. C.—488.

Class 513.—*Utility Australorp Hens or Pullets.*

500 I.—F. J. Cheshire, 22, Wharf Road, Grantham.
499 II.—A. J. Spink, Stud Farm, Weston, Newark.
496 III.—J. E. H. & Miss Venning, Trefrank, St. Clether, Launceston.
497 IV.—J. H. Beever, Wansford, Driffield.
498 R.N.—T. B. Clarkson, Bond's P.F., Pilling, Preston.
H.C.—494. C.—493, 495.

Class 514.—*Utility White Wyandotte Cocks or Cockerels.*

504 I.—Sir Duncan Watson, Homelea P.F., Leigh Green, Reigate.
503 II.—Hugh Gunn, Mayfield, Churchdown, Glos.
505 III.—William Morgan, Balcurvie, Windygates, Fife.
502 IV.—Arthur Snowden, Clayton Hall P.F., Cross Hills, Keighley.
501 R.N.—J. E. Atherton, Kingcott Farm, Flax Bourton, Bristol.

Class 516.—*Utility Buff Plymouth Rock Cocks or Cockerels.*

507 I. & R.N. for Special.—Major L. C. Chawner, Little Barrs, New Milton, Hants.
510 II.—Bilsborough & Bland, Park Lane P.F., Forton, Preston.
508 III.—Arthur Snowden, Clayton Hall P.F., Cross Hills, Keighley.
512 IV.—John Healey, Kiln Bank, Croft, Market Drayton.
511 R.N.—The Rev. J. H. Peall, St. Richard's, Slindon, Sussex.

Class 517.—*Utility Buff Plymouth Rock Hens or Pullets.*

517 I. & Special.—Bilsborough & Bland, Park Lane P.F., Forton, Preston.
518 II.—John Healey, Kiln Bank, Croft, Market Drayton.
513 III. & 519 R.N.—H. T. Stonex, Burlands Farm, Staplegrove, Taunton.
514 IV.—Arthur Snowden, Clayton Hall P.F., Cross Hills, Keighley.
H.C.—515.

Class 518.—*Utility Plymouth Rock Cocks or Cockerels, any other colour.*

521 I.—Hugh Gunn, Mayfield, Churchdown, Glos.
522 II.—W. W. W. Butt, Eastfield P.F., North Thoresby, Lincs.
523 III.—H. J. Bale, Virginia Water.

Class 520.—*Utility Light Cocks or Cockerels, any other variety.*

524 I.—Andrew Southerin, 88, Burnley Road, Padiham. Ancona.
525 II.—W. W. W. Butt, Eastfield P.F., North Thoresby, Lincs. Minorca.
527 III.—Edmund Holt, The Limes, Pulford, Wrexham. Ancona.
526 IV.—J. H. Baker & Son, Windyash, Barnstaple. Ancona.

Class 521.—*Utility Light Hens or Pullets, any other variety.*

529 I.—Andrew Southerin, 88, Burnley Road, Padiham. Ancona.
532 II.—Edmund Holt, The Limes, Pulford, Wrexham. Ancona.
533 III.—Chas. Hargreaves, Cow Hey Farm, Great Harwood, Blackburn. Andalusian.
531 IV.—J. H. Baker & Son, Windyash, Barnstaple. Ancona.
528 R.N.—E. R. Pease, Croft House, Croft-on-Tees, Darlington.

Class 523.—*Utility Heavy Hens or Pullets, any other variety.*

534 I.—Tom Trigg, The Oaks, Anthill, Denmead, Cosham. White Orpington.
537 II.—Mrs. E. Mills, Woodford Hall, Milton Damarel, Devon. Croad Langshan.
536 III.—A. J. Major, Ditton, Langley, Bucks. Dorking.
535 IV.—W. G. Vivian & Son, 5, Stanhope Square, Holsworthy. Jersey Black Giant.
538 R.N.—S. W. Hopkinson, Alton P.F., Alton, Tupton, Chesterfield.

Class 525.—*Utility Heavy Hens.*[1]

542 I.—Sir Duncan Watson, Homelea P.F., Leigh Green, Reigate.
539 II.—Arthur Snowden, Clayton Hall P.F., Cross Hills, Keighley. Rhode Island Red.
540 III. & 544 IV.—Richard Moore, The Orchards, Long Sutton, Wisbech. Rhode Island Red.
541 R.N.—Major & Mrs. J. Hibbert, The Hermitage, Kenilworth. Rhode Island Red.

Class 528.—*Modern Game Bantam Cocks or Cockerels.*

551 I.—Sidney Newton, 1, Arundel Drive, Mansfield.
549 II.—H. Whitley, Primley, Paignton.
550 III.—H. Hough-Watson, Braystones House, Beckermet.
546 IV.—Harry Fox, International Poultry Yards, Matlock.
547 R.N.—T. H. Egglestone, St. John's Chapel, Weardale.
H.C.—548.

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[1] Class 525 is for birds that have secured the Copper Ring issued by the National Poultry Council, and Exhibits must wear the ring to be eligible to compete.

Class 529.—*Modern Game Bantam Hens or Pullets.*

554 I.—H. Whitley, Primley, Paignton.
555 II.—Sidney Newton, 1, Arundel Drive, Mansfield.
552 III.—E. W. Allenby, Three Oaks, Virginia Water.
553 IV.—A. B. Memmory, Littleover Prize Farm, Derby.

Class 530.—*Spangled Old English Game Bantam Cocks or Cockerels.*

558 I.—H. Whitley, Primley, Paignton.
557 II.—W. Harper, Melrose, Garndiffaith, Pontypool.
559 III.—Sidney Newton, 1, Arundel Drive, Mansfield.
556 IV.—M. C. Cox, Marshwood Manor, Bridport.

Class 531.—*Spangled Old English Game Bantam Hens or Pullets.*

561 I.—Harry Fox, International Poultry Yards, Matlock.
564 II.—W. Harper, Melrose, Garndiffaith, Pontypool.
563 III.—H. Whitley, Primley, Paignton.
560 IV. & 565 R.N.—M. C. Cox, Marshwood Manor, Bridport.
H.C.—562.

Class 532.—*Old English Game Bantam Cocks or Cockerels, any other colour.*

571 I.—Chas. A. Edwards, Main Road Lodge, Langleybury, Hunton Bridge, King's Langley, Herts.
566 II.—H. Whitley, Primley, Paignton.
572 III.—J. H. Baker & Son, Windyash, Barnstaple.
568 IV.—Miss M. Wenger, Trentham Priory, Stoke-on-Trent.
569 R.N.—W. Harper, Melrose, Garndiffaith, Pontypool.
H.C.—570. C.—567.

Class 533.—*Old English Game Bantam Hens or Pullets, any other colour.*

573 I.—E. W. Allenby, Three Oaks, Virginia Water.
577 II.—Miss M. Wenger, Trentham Priory, Stoke-on-Trent.
575 III.—H. Whitley, Primley, Paignton.
574 IV.—R. H. Crompton, Wix Hill House, West Horsley, Surrey.
578 R.N.—Mrs. E. J. Clements, St. Dunstan House, Nailsea, Somerset.
H.C.—579. C.—576.

Class 536.—*Sebright Bantam Cocks or Cockerels.*

586 I.—H. Hough-Watson, Braystones House, Beckermet.
583 II. & 587 III.—T. H. Sheldon, Cotham Manor, Newark.
584 IV.—Robert Bennett, The Butts, Frome.
585 R.N.—Mrs. E. J. Clements, St. Dunstan House, Nailsea, Somerset.
H.C.—582.

Class 537.—*Sebright Bantam Hens or Pullets.*

592 I. & 589 IV.—T. H. Sheldon, Cotham Manor, Newark.
588 II.—G. A. Drake, 37, North Street, Braunton, Devon.
590 III.—H. Hough-Watson, Braystones House, Beckermet.
591 R.N.—Robert Bennett, The Butts, Frome.

Class 538.—*Rhode Island Red Bantam Cocks or Cockerels.*

595 I. & Special.—Ernest E. Pickersgill, Shenstone, Barton Court Road, New Milton.
593 II.—J. G. Williamson, 4, Chester Road, Middlewich.
597 III.—J. T. Wright, Prospect House, Hemingbrough, Selby.
594 IV.—Frank H. Page, Woodlands, Great Horkesley, Colchester.

Class 539.—*Rhode Island Red Bantam Hens or Pullets.*

600 I. & R.N. for Special.—J. T. Wright, Prospect House, Hemingbrough, Selby.
599 II.—J. G. Williamson, 4, Chester Road, Middlewich.
603 III. & 598 R.N.—Ernest E. Pickersgill, Shenstone, Barton Court Road, New Milton.
601 IV.—Frank H. Page, Woodlands, Great Horkesley, Colchester.

Class 540.—*Bantam Cocks or Cockerels, any other variety.*

611 I.—H. Hough-Watson, Braystones House, Beckermet. Japanese.
613 II.—J. H. Baker & Son, Windyash, Barnstaple.
612 III.—Edgar P. Morton, Salroyd House, Low Moor, Bradford. Black Rosecomb.
606 IV.—Capt. G. E. Coppard, 63, Church Road, Wimbledon, London, S.W.19. Poland.
604 R.N.—Miss Hazel ffennell, Wytham Abbey, Oxford. Frizzle.
H.C.—605. C.—608.

Class 541.—*Bantam Hens or Pullets, any other variety.*

620 I.—J. H. Baker & Son, Windyash, Barnstaple.
618 II.—Edgar P. Morton, Salroyd House, Low Moor, Bradford. Black Rosecomb.
615 III.—Miss Hazel ffennell, Wytham Abbey, Oxford. Frizzle.
616 IV.—H. Hough-Watson, Braystones House, Beckermet. Japanese.
614 R.N.—A. B. Memmory, Littleover Prize Farm, Derby. Light Brahma.
H.C.—617. C.—619.

Class 543.—*Aylesbury, Pekin or Rouen Ducks.*

622 I.—G. T. MacBean, Chapel Villas, Lee Moor, Cornwood, Devon. Aylesbury.
624 II.—A. F. Rowe, 49, Fore Street, Bovey Tracey. Aylesbury.
625 III.—The Rev. J. Hewetson, Burbage Vicarage, Buxton. Rouen.
623 IV.—J. Ellams, Oaklands, Rossmore Gardens, Little Sutton, Cheshire. Aylesbury.

Class 544.—*Indian Runner Drakes or Ducks, bred prior to* 1936.

629 I. & 632 R.N.—The Rev. J. Hewetson, Burbage Vicarage, Buxton.
631 II. & 628 IV.—H. Hough-Watson, Braystones House, Beckermet.
630 III.—Reginald Appleyard, Priory Waterfowl Farm, Ixworth, Bury St. Edmunds.
H.C.—626.

Class 545.—*Indian Runner Drakes or Ducks, bred in* 1936.

634 I.—H. Hough-Watson, Braystones House, Beckermet.
635 II.—The Rev. J. Hewetson, Burbage Vicarage, Buxton.
633 III. & 636 IV.—Reginald Appleyard, Priory Waterfowl Farm, Ixworth, Bury St. Edmunds.

Class 546.—*Drakes, any other variety.*

639 I.—Major L. C. Chawner, Little Barrs, New Milton, Hants. Cayuga.
638 II.—A. J. Major, Ditton, Langley, Bucks. Muscovy.
642 III.—Reginald Appleyard, Priory Waterfowl Farm, Ixworth, Bury St. Edmunds. Muscovy.
640 IV. & 637 R.N.—John H. Butler, Gatcombe, Flax Bourton, Bristol. Khaki Campbell.
H.C.—641.

Class 548.—*Embden Ganders or Geese.*

646 I.—Reginald Appleyard, Priory Waterfowl Farm, Ixworth, Bury St. Edmunds.
645 II.—Edmund Holt, The Limes, Pulford, Wrexham.

Class 550.—*Turkey Cocks.*

649 I.—E. P. Woollatt, Dunstons Farm, Lavenham, Suffolk.
651 II.—H. Whitley, Primley, Paignton.
648 III.—F. E. Peele, Thuxton, Norwich.
650 IV.—Capt. C. C. Brill, Courtlands, Corsham, Wilts.
647 R.N.—Capt. B. T. Dickenson, Raglands, Bishopstone, Salisbury.

Classes omitted were cancelled owing to insufficient entries.

EGGS.

The Prizes in each Class for Eggs, except Class 556, are as follows: First Prize, 20s.; Second Prize, 15s.; Third Prize, 10s.; Fourth Prize, 5s.

Class 552.—*Twelve Brown Hens' Eggs.*

1 I.—Miss A. C. H. Crewe, Corfe House, Taunton.
7 II.—James W. Hird, Coppy House, Clapham, Lancaster.
5 III.—Mrs. Beatrice Hambly, Red House, Brixton, Devon.
12 IV.—Miss P. Peer, Rectory Farm, Tibberton, Droitwich.
3 R.N.—Miss Charlotte Fawkes, Fern Bank Farm, Balsall Common, Coventry.
H.C.—6, 11. C.—14.

Class 553.—*Twelve White or Cream Hens' Eggs.*

23 I.—Thomas Muir, Ballencrieff Poultry Farm, Bathgate.
20 II.—Mrs. Dredge, Barton Farm, Holwell, Sherborne.
18 III. & 17 R.N.—Cohen & Brookfield, Small House, Condover.
19 IV.—Mrs. E. R. Criddle, Baugh Farm, Downend, Bristol.

Class 554.—*Twelve Tinted Hens' Eggs.*

29 I.—R. Garside, Oak Cottage, Mobberley, Cheshire.
26 II. & 25 III.—Cohen & Brookfield, Small House, Condover.
33 IV.—V. C. Newton, Oak Cottage, Langford, Bristol.

30 R.N.—S. Hoskin, Jun., Higher Venton, Sparkwell, Plympton, Devon.
C.—31.

Class 555.—*Twelve Ducks' Eggs.*

37 I.—John H. Butler, Gatcombe, Flax Bourton, Bristol.
43 II.—V. C. Newton, Oak Cottage, Langford, Bristol.

Class 556.—*Packs of* 15 *dozen Eggs, statutory grade, the Produce of a Producer-owned Packing Station.*

53 I. £3.—Poultry Producers (W.R.), Ltd., The Packing Station, Whitehall Road, Drighlington, Bradford.
54 II. £2.—Scientific Poultry Breeders' Association, 63, George Street, Banbury.
51 III. £1.—East Anglian Egg Packing Station, Ltd., Paddock Street, Soham, Ely, Cambs.

47 R.N.—Blackburn and Preston Egg and Poultry Producers, Ltd., Sawrey Street, Cherry Tree, Blackburn.
H.C.—50. C.—46.

FARM AND DAIRY PRODUCE OF THE UNITED KINGDOM.

Butter.

The Prizes in each Class for Butter are as follows: First Prize, £3; Second Prize, £2; Third Prize, £1; Fourth Prize, 10s.; Fifth Prize, 5s.

Class 557.—*Two pounds of Fresh Butter, without any salt, made up in plain pounds, from the milk of Channel Island, Devon or South Devon Cattle and their crosses.*

64 I. & R.N. for Champion.[1]—Miss M. M. Varker, Fraddam, Gwinear, Hayle.
61 II.—J. Pierpont Morgan, Wall Hall, Aldenham, Watford.
55 III.—His Majesty the King, Sandringham, Norfolk.
65 IV.—Mrs. John Way, West Bridge, Bishops Nympton, South Molton.

60 R.N.—Mrs. J. Mogford, Overcott, Rose Ash, South Molton.
H.C.—56. C.—57.

Class 558.—*Two pounds of Fresh Butter, without any salt, made up in plain pounds, from the milk of cattle of any breed or cross other than those mentioned in Class* 557.

70 I.—Mrs. M. C. Inge, Thorpe Hall, Tamworth.
68 II.—A. G. Dennis, Lower Pulworthy, Highampton, Beaworthy.
69 III.—Miss Nancy Hutton, Dairy Department, Co-operative Society, Ltd., Burnley.
71 R.N.—Miss A. M. Ward, Foggathorpe Hall, Selby.

Class 559.—*Two pounds of Fresh Butter, slightly salted, made up in plain pounds, from the milk of Channel Island, Devon or South Devon Cattle and their crosses.*

84 I. & Champion.[1]—Miss M. M. Varker, Fraddam, Gwinear, Hayle.
85 II.—Mrs. John Way, West Bridge, Bishopsnympton, South Molton.
73 III.—Mrs. G. E. Blackler, West Leigh, Modbury.
72 IV.—His Majesty the King, Sandringham, Norfolk.
79 V.—Mrs. J. Mogford, Overcott, Rose Ash, South Molton.
80 R.N.—J. Pierpont Morgan, Wall Hall, Aldenham, Watford.
C.—75.

Class 560.—*Two pounds of Fresh Butter, slightly salted, made up in plain pounds, from the milk of cattle of any breed or cross other than those mentioned in Class* 559.

91 I.—Mrs. P. Roach, Beersheber, Lelant, Cornwall.
87 II.—A. G. Dennis, Lower Pulworthy, Highampton, Beaworthy.
92 III.—Miss A. M. Ward, Foggathorpe Hall, Selby.
89 R.N.—Mrs. M. C. Inge, Thorpe Hall, Tamworth.

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[1] Champion Prize of £5 given for the best Exhibit of Butter.

Class 561.—*Three pounds of Fresh Butter, slightly salted, made up in pounds in the most attractive marketable designs.*

103 I.—Mrs. John Way, West Bridge, Bishopsnympton, South Molton.
96 II.—Mrs. J. Mogford, Overcott, Rose Ash, South Molton.
101 III.—Miss M. M. Varker, Fraddam, Gwinear, Hayle.
97 IV.—J. Pierpont Morgan, Wall Hall, Aldenham, Watford.

93 R.N.—His Majesty the King, Sandringham, Norfolk.
H.C.—94.

Cheese.

Made in 1936.

Unless otherwise stated, the Prizes in each Class for Cheese are as follows: First Prize, £5; Second Prize, £3; Third Prize, £2; Fourth Prize, 10s.; Fifth Prize, 5s.

Class 562.—*Two Cheshire Cheeses, coloured, not less than* 40 *lb. each.*

127 I.—P. H. Walley, Towns Green Farm, Wettenhall, Winsford, Cheshire.
122 II.—F. Perry, Breeze Hill, Chorley, Nantwich.
126 III.—R. Walker, Hatton Hall, Chester.
129 IV.—Thomas W. Young, Sicilly Oak Farm, Cholmondeley, Malpas.
108 V.—W. E. Blake, Cross Lanes, Bickley, Malpas.

116 R.N.—F. Hesketh, Cholmondeston, Nantwich.
H.C.—106, 119.

Class 563.—*Two Cheshire Cheeses, uncoloured, not less than* 40 *lb. each.*

141 I.—Thomas W. Young, Sicilly Oak Farm, Cholmondeley, Malpas.
139 II.—H. H. Jones, Upper Trench Farm, Wem, Shropshire.
136 III.—F. Hesketh, Cholmondeston, Nantwich.
133 IV.—W. E. Blake, Cross Lanes, Bickley, Malpas.
138 V.—G. F. Hollinshead, Woodside, Wettenhall, Winsford.

137 R.N.—W. H. Hobson, Woodhey Hall, Nantwich.

Class 564.—*Two Cheshire Cheeses, coloured or uncoloured, not less than* 40 *lb. each, restricted to makers who have not won a* 1st, 2nd *or* 3rd *Prize at a R.A.S.E. Show for the last five years.*

151 I.— F. Hesketh, Cholmondeston, Nantwich.
161 II.—P. H. Walley, Towns Green Farm, Wettenhall, Winsford.
155 III.—Allen Noden, Wettenhall, Winsford, Cheshire.
144 IV.—A. Blake, Egerton Hall, Malpas.
143 V.—J. C. Barnett, The Hully, Tybroughton, Whitchurch, Shropshire.

156 R.N.—F. Perry, Breeze Hill, Chorley, Nantwich.

Class 565.—*Two Cheddar Cheeses, not less than* 50 *lb. each.*

174 I.—A. H. Phillips, Bristol Pure Milk Co., Ltd., Durnford Street, Ashton Gate, Bristol.
164 II.—Geo. Barnes, Hatherleigh, Wincanton.
175 III.—Herbert H. Pickford, Manor Farm, Patney, Devizes.
179 IV.—Sidney T. White, Sock Dennis Farm, Ilchester.
171 V.—R. G. Mapstone, Northload Hall Farm, Glastonbury.

169 R.N.—A. H. Hunt, Dropping Lane Farm, Bruton.
H.C.—163, 176.

Class 566.—*Two Cheddar Cheeses, not more than* 50 *lb. each.*

183 I.—A. H. Hunt, Dropping Lane Farm, Bruton.
181 II.—Geo. Barnes, Hatherleigh, Wincanton.
190 III.—Sidney T. White, Sock Dennis Farm, Ilchester.
188 IV.—Frank Portch, Leigh Farm, Wincanton.

H.C.—189.

Class 567.—*Two Loaf or other Cheddar Truckles.*

198 I.—A. H. Hunt, Dropping Lane Farm, Bruton.
201 II.—R. G. Mapstone, Northload Hall Farm, Glastonbury.
205 III.—H. H. Pickford, Manor Farm, Patney, Devizes.
206 IV.—Frank Portch, Leigh Farm, Wincanton.
192 V.—Donald T. Banwell, Westwood Farm, Keevil, Trowbridge.

195 R.N.—N. R. Ellis, Lower Coombe Farm, Rampisham, Dorchester.
H.C.—193, 196.

Class 568.—*Two Stilton Cheeses.*

219 I.—Wilts. United Dairies, Ltd., Harby, Melton Mowbray.
214 II.—Long Clawson Dairy, Ltd., Long Clawson, Melton Mowbray.
213 III.—Long Clawson Dairy, Ltd., Hose, Melton Mowbray.
216 IV.—Scalford Dairy, Ltd., Scalford, Melton Mowbray.
H.C.—215.

Class 569.—*Two Wensleydale Cheeses, Stilton Shape.*

221 I.—Miss B. J. Mudd, Aldborough Dairy, Boroughbridge.
222 II.—Alfred Rowntree & Sons, Coverham, Middleham.

Class 570.—*Two Double Gloster Cheeses, from* 24 *lb. to* 30 *lb. each.*

226 I.—A. H. Hunt, Dropping Lane Farm, Bruton.
227 II.—H. H. Pickford, Manor Farm, Patney, Devizes.
230 III.—B. H. J. W. White, Hill View Farm, Bruton.
H.C.—225.

Class 571.—*Two Single Gloster Cheeses, from* 12 *lb. to* 16 *lb. each.*

233 I.—Mrs. F. J. Pain, Woodend Green Farm, Cam, Glos.
235 II.—Frank Portch, Leigh Farm, Wincanton.
237 III.—Mrs. John Taylor, White House Farm, Earthcott, Alveston, Bristol.
H.C.—234.

Class 572.—*Two Caerphilly Cheeses.*

240 I.—Cheddar Valley Dairy Co., Ltd., Rooksbridge, Axbridge.
238 II.—W. H. Amesbury, Webbington Farm, Axbridge.
250 III.—A. H. Phillips, Bristol Pure Milk Co., Ltd., Durnford Street, Ashton Gate, Bristol.
244 IV.—Joe Gibbs, Green Farm, Biddisham, Axbridge.
248 V.—R. G. Mapstone, Northland Hall Farm, Glastonbury.
243 R.N.—Mrs. C. Edwards, Taleford Farm, Ottery St. Mary.
H.C.—252.

Class 573.—*Two Small Cheeses, not exceeding* 6 *lb. each, of Cheddar or Cheshire character.*

255 I. (£3).—Henry Barnett, Overton Hall, Malpas.
264 II. (£2).—Frank Portch, Leigh Farm, Wincanton.
267 III. (£1).—B. H. J. W. White, Hill View Farm, Bruton.
253 IV. (10s.).—Donald T. Banwell, Westwood Farm, Keevil, Trowbridge.
258 V. (5s.).—W. H. Hobson, Woodhey Hall, Nantwich.
259 R.N.—A. H. Hunt, Dropping Lane Farm, Bruton.
H.C.—266.

Class 574.—*Two Small Cheeses, not exceeding* 6 *lb. each, of Stilton or Wensleydale character.*

275 I. (£3).—Tuxford & Tebbutt, Ltd., Thorpe End, Melton Mowbray.
270 II. (£2).—Long Clawson Dairy, Ltd., Hose, Melton Mowbray.
271 III. (£1).—Long Clawson Dairy, Ltd., Long Clawson, Melton Mowbray.
273 R.N.—J. M. Nuttall & Co., Ltd., Dove Dairy, Hartington, Buxton.
H.C.—276.

Class 575.—*Two Soft Cheeses, made from whole milk.*

278 I. (£3).—Miss Rachel James, Llancayo, Usk.
279 II. (£2).—Miss McLaren, The Drove Way, Buxted, Uckfield.
282 III. (£1).—Miss Ruth M. Pain, Woodend Green Farm, Cam, Glos.
280 R.N.—Monmouthshire Agricultural Institute, Usk.

Class 576.—*Two Cheeses, made from cream without the addition of rennet.*

283 I. (£3).—His Majesty the King, Sandringham, Norfolk.
287 II. (£2).—Monmouthshire Agricultural Institute, Usk.
289 III. (£1).—Mrs. Okeden, Stutton House, Stutton, Ipswich.
288 R.N.—Capt. & Mrs. V. Morse, Upper Cowden, Five Ashes, Sussex.

Cider.

The Prizes in each Class for Cider are as follows: First Prize, £3; Second Prize, £2; Third Prize, £1; Fourth Prize, 10s.

Class 577.—*Casks of Cider, not less than* 6 *gallons, made in* 1935 *by an Exhibitor whose main occupation is Farming.*

292 I.—H. W. Davis, Sutton Montis, Yeovil.
291 II.—D. J. Crofts, Sutton Farm, Sutton Montis, Yeovil.
293 III.—M. J. Pearce, Upton Farm, Strode, Winsford, Bristol.
294 R.N.—H. H. Sealy & Son, Honeyhurst Farm, Rodney Stone, Cheddar.

Class 578.—*Casks of Cider, not less than* 6 *gallons, made in* 1935.

302 I.—Lythecourt Cider Press, Knightshayes Estate Office. Tiverton.
301 II.—Gloucestershire Cider Co.. Ltd., Wickwar, Glos.
304 III.—H. H. Sealey & Son, Honeyhurst Farm, Rodney Stone, Cheddar.
303 R.N.—M. J. Pearce, Upton Farm, Strode, Winsford, Bristol.

Class 579.—*Six bottles of Cider, made in* 1935 *by an Exhibitor whose main occupation is Farming.*

309 I.—Reginald J. J. Denning, Little Ashwell Farm, Ilminster.
310 II.—M. J. Pearce, Upton Farm, Strode, Winsford, Bristol.
312 III.—H. H. Sealy & Son, Honeyhurst Farm, Rodney Stone, Cheddar.
313 R.N.—W. Follett Snell, Marsh Farm, Yeovil.

Class 580.—*Six bottles of Dry Cider, made in* 1935.

324 I.—H. H. Sealey & Son, Honeyhurst Farm, Rodney Stone, Cheddar.
322 II.—Pullin Bros., Spaniorum Farm, Compton Greenfield, Bristol.
320 III.—M. J. Pearce, Upton Farm, Strode, Winsford, Bristol.
317 R.N.—H. W. Davis, Sutton Montis, Yeovil.
H.C.—318.

Class 581.—*Six bottles of Sweet Cider, made in* 1935.

337 I. & 338 IV.—Quantock Vale Cider Co., Ltd., North Petherton, Bridgwater.
339 II. & 340 R.N.—H. H. Sealy & Son, Honeyhurst Farm, Rodney Stone, Cheddar.
329 III.—Gloucestershire Cider Co., Ltd., Wickwar, Glos.
H.C.—330, 336. C.—335.

Class 582.—*Six bottles of Cider, made previous to* 1935.

347 I.—Pullin Bros., Spaniorum Farm, Compton Greenfield, Bristol.
345 II.—Gloucestershire Cider Co., Ltd., Wickwar, Glos.
349 III.—Severn Vale Cider Co., Ltd., Bushley, Gloucester.
348 R.N.—B. Rogers, Wreath Farm, Chard.

Class 583.—*Six bottles of Cider, bearing the National Mark, made in* 1935.

356 I.—H. H. Sealy & Son, Honeyhurst Farm, Rodney Stone, Cheddar.
351 II.—Reginald J. J. Denning, Little Ashwell Farm, Ilminster.
355 III.—Quantock Vale Cider Co., Ltd., North Petherton, Bridgwater.
352 R.N.—Lythecourt Cider Press, Knightshayes Estate Office, Tiverton.

Wool.[1]

Of 1936 clip.

First Prize, £3; Second Prize, £2; Third Prize, £1, in each Class.

Class 584.—*Three Fleeces of Oxford Down Wool.*

363 I.—H. W. Stilgoe, The Grounds, Adderbury, Banbury.
360 II. & 361 III.—Hobbs & Davis, Kelmscott, Lechlade.

Class 585.—*Three Fleeces of Shropshire Wool.*

365 I.—A. E. & W. Everall, Sherlowe, Wellington, Shropshire.
366 II. & 367 III.—E. Craig Tanner, Eyton-on-Severn, Wroxeter, Shropshire.

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[1] The Second and Third Prizes in these Classes were given by the respective Flock Book Societies.

Class 586.—*Three Fleeces of Southdown Wool.*

369 I. & Special.[1]—His Majesty the King, Sandringham, Norfolk.
374 II.—Herbert D. Shields, Borderlands, Culford, Suffolk.
373 III.—J. Pierpont Morgan, Wall Hall, Aldenham, Watford.
375 R.N.—Joe K. Williamson, Derwen Hall, Ruthin.

Class 587.—*Three Fleeces of Hampshire Down Wool.*

377 I.—E. Clifton-Brown, Burnham Grove, Burnham, Bucks.
379 II. & 378 III.—William Todd, Little Ponton Grange, Grantham.

Class 588.—*Three Fleeces of Suffolk Wool.*

382 I. & R.N. for Special.[1]—Sir Prince Prince-Smith, Bart., Southburn, Driffield.

Class 589.—*Three Fleeces of Dorset Down Wool.*

384 I. & 383 II.—Leonard Tory, Turnworth, Blandford.

Class 590.—*Three Fleeces of Dorset Horn Wool.*

385 I.—C. J. Hambro, Hedge End, Blandford.

Class 591.—*Three Fleeces of Ryeland Wool.*

390 I. & 389 III.—David J. Thomas, Monachty, Abergavenny.
386 II.—T. W. Montague Perkins, Ufton Court, Holme Lacy, Hereford.

Class 592.—*Three Fleeces of Kerry Hill (Wales) Wool.*

391 I. & 392 III.—John T. Beavan, Winsbury, Chirbury, Montgomery.
393 II.—J. W. Owens, Woodhouse, Shobdon, Herefordshire.

Class 593.—*Three Fleeces of Lincoln Wool.*

398 I. & R.N. for Special.[1]—Clifford Nicholson, Willoughton Manor, Lincoln.
397 II. & 396 III.—D. F. Browett, Thornton House, Thornton, Horncastle.

Class 595.—*Three Fleeces of Wensleydale Wool.*

400 I. & 399 II.—John Percival, Easthouse, Carperby, Yorks.

Class 596.—*Three Fleeces of Kent or Romney Marsh Wool, from Rams of any age.*

401 I.—E. W. Baker, Parsonage Farm, Bekesbourne, Canterbury.
404 II.—Ashley Stevens, Davington Hall, Faversham.
402 III.—L. H. Finn, The Mall, Faversham.

Class 597.—*Three Fleeces of Kent or Romney Marsh Wool, from Ewe Tegs.*

406 I.—L. H. Finn, The Mall, Faversham.
409 II.—Ashley Stevens, Davington Hall, Faversham.
407 III.—Clifford Nicholson, Willoughton Manor, Lincoln.

Class 598.—*Three Fleeces of Kent or Romney Marsh Wool, excluding Rams or Ewe Tegs.*

411 I. & Special[2] & 412 II.—L. H. Finn, The Mall, Faversham.
410 III.—E. W. Baker, Parsonage Farm, Bekesbourne, Canterbury.

Class 599.—*Three Fleeces of Welsh Mountain Wool.*

420 I.—Joe K. Williamson, Derwen Hall, Ruthin.
417 I., & 416 III.—Major Eric J. W. Platt, Madryn Farm, Aber, Caernarvonshire.

Class 600.—*Three Fleeces of Black Welsh Mountain Wool.*

425 I.—Major F. H. T. Jervoise, Herriard Park, Basingstoke.
421 II.—The Hon. Mrs. C. Behrens, Swinton Grange, Malton.
423 III.—Miss J. V. Horn, Woodcote Park, Blackshiels, Midlothian.

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[1] Special Cash Prize, known as the "Merchants of the Staple of England" Prize, given for the best fleece taken from any short-woolled breed of sheep.

[2] Special Cash Prize, known as the "Merchants of the Staple of England" Prize, given for the best fleece taken from any long-woolled breed of sheep.

BUTTER-MAKING COMPETITIONS.

Class 1.—*Open to Students who have attended a course at any Dairy School in Gloucestershire, Somersetshire, Wiltshire or Monmouthshire, and who have not won a First Prize at any Show.*

10 I. (£4).—Miss R. M. Fear, Yew Tree Farm, Morton, Thornbury, Bristol.
3 II. (£3).—Miss Eurwen Bevan, Monmouthshire Agricultural Institute, Usk.
21 III. (£2).—Miss Marjorie Payne, Monmouthshire Agricultural Institute, Usk.
8 IV. (£1).—Miss Edna Davies, Monmouthshire Agricultural Institute, Usk.

9 R.N.—Miss Winifred Evans, Monmouthshire Agricultural Institute, Usk.
H.C.—12, 19. C.—23, 25.

Class 2.—*Open to Students who have received not less than one month's instruction at any Dairy School and who have not won a First or Second Prize at the R.A.S.E., London Dairy, Bath and West, Royal Counties, Three Counties, Royal Welsh, Royal Lancashire or Yorkshire Shows.*

Section A.

36 I. (£4).—Miss Margaret A. Blore, Wessex Hall, Reading.
42 II. (£3).—Miss Edna Davies, Monmouthshire Agricultural Institute, Usk.
46 III. (£2).—Miss Winifred Evans, Monmouthshire Agricultural Institute, Usk.
45 IV. (£1).—Miss Edytha H. Eustice, Tappard Farm, Gwinear, Hayle.

38 R.N.—Miss Eveline C. Burgess, British Dairy Institute, Reading.
H.C.—33, 43.

Section B.

55 I. (£4).—Miss Enid Jones, Walton Farm, Kington, Herefordshire.
60 II. (£3).—Miss Dorothy M. Powell, Maerdy, Lower Maescoed, Pontrilas, Hereford.
59 III. (£2).—Miss Marjorie Payne, Monmouthshire Agricultural Institute, Usk.
63 IV. (£1).—Miss Peggy West, Hay, Wadebridge.

47 R.N.—Miss E. Foster, Tryfan, Orpen Road, Hove.
H.C.—49, 56.

Class 3a.—*Open to those who have not won a First or Second Prize at any Show.*

78 I. (£4).—Miss Laurie Gibbs, Pigeon House Farm, Stock Green, Redditch.
72 II. (£3).—Miss K. Curnow, Treveor, Tresillian, Truro.
76 III. (£2).—Miss Winifred Evans, Monmouthshire Agricultural Institute, Usk.
74 IV. (£1).—Miss H. J. Derrett, Somerset Farm Institute, Cannington, Bridgwater.

66 R.N.—Miss Eurwen Bevan, Monmouthshire Agricultural Institute, Usk.
H.C.—71. C.—73, 75.

Class 3b.—*Open to those who have not won a First or Second Prize at any Show.*

90 I. (£4).—Miss Dorothy M. Powell, Maerdy, Lower Maescoed, Pontrilas, Hereford.
84 II. (£3).—Miss Enid Jones, Walton Farm, Kington, Herefordshire.
89 III. (£2).—Miss Marjorie Payne, Monmouthshire Agricultural Institute, Usk.
85 IV. (£1).—Miss E. D. Kingwell, Somerset Farm Institute, Cannington, Bridgwater.

81 R.N.—Miss Nancy Heath, Monmouthshire Agricultural Institute, Usk.
H.C.—82, 87.

Class 4.—*Open, except to Champions at the R.A.S.E., London Dairy, Bath and West, Royal Counties, Royal Lancashire or Yorkshire Shows.*

Section A.

112 I. (£5).—Miss Olga Eustice, Bezurrel, Gwinear, Hayle.
126 II. (£4).—Miss P. Jones, Goodships, Bromyard, Hereford.
117 III. (£3).—Miss Mary W. Gwennap, Splattenridden, Lelant.
127 IV. (£2).—Miss Muriel Joslin, Stone, Brayford, Barnstaple.
116 V. (£1).—Mrs. E. V. Gully, Arosfa, Monmouth Road, Usk.

120 R.N.—Miss Mabel A. Headon, Grants Farm, Exbridge, Dulverton.
H.C.—114, 122. C.—100, 104.

Section B.

138 I. (£5).—Miss P. Peer, Rectory Farm, Tibberton, Droitwich.
132 II. (£4).—Miss Muriel Mill, Thongsleigh, Cruwys, Morchard, Tiverton.
135 III. (£3).—Miss Monica M. Olde, Clifton House, Boscastle.
144 IV. (£2).—Miss M. E. Sandercock, Venterdon, Stoke Climsland, Callington.
156 V. (£1).—Miss Peggy West, Hay, Wadebridge.

146 R.N.—Miss Lilla Smith, Haydon Villa, Staverton, Cheltenham.
H.C.—128, 134, 136. C.—141, 143, 145.

Class 5.—*Inter-County Championship for teams of three, one of whom must be a Novice never having won a First or Second Prize up to the time of entry, the second member must not have won more than three First Prizes and must never have won any Championship, the third member may be a Champion at this or any Show.*

159 I. (£3 & Silver Medal each).—Miss Mary E. Blight, Tregonning, Breage, Helston.
Miss Monica M. Olde, Clifton House, Boscastle.
Miss Thora Rowe, Trethannas, Praze, Crowan.

160 II. (£2 each).—Miss E. Mary Cole, West Catkill, Rose Ash, South Molton.
Miss Muriel Mill, Thongsleigh, Cruwys, Morchard, Tiverton.
Mrs. J. Mogford, Overcott, Rose Ash, South Molton.

166 III. (£1 each).—Miss Laurie Gibbs, Pigeon House Farm, Stock Green, Redditch.
Miss Dorothy Smith, The Hermitage, Wadborough, Worcester.
Miss Sadie T. Lewis, Hadley Farm, Hadley, Droitwich.

163 R.N.—Miss Irene Evans, Netherton, Harwood End, Ross-on-Wye.
Miss Evelyn Holloway, Sevington, Acton Beauchamp, Worcester.
Miss G. D. Matthews, Bower's Farm, Bridstow, Ross-on-Wye.

H.C.—164. C.—162.

Class 6.—*Championship open to the First Prize Winners in the preceding Classes or at any previous R.A.S.E. Show, and to Champions of the London Dairy, Bath and West, Royal Counties, or any County Show.*

169 I. (£5 & Gold Medal).—Miss Olga Eustice, Bezurrel, Gwinear, Hayle.
175 II. (£4).—Mrs. J. Mogford, Overcott, Rose Ash, South Molton.
178 III. (£3).—Miss M. E. Sandercock, Venterdon, Stoke Climsland, Callington.
176 IV. (£2).—Miss N. M. Paull, Leyonne, Par, Cornwall.
171 V. (£1).—Miss Madelene Lee, Bath Arms Hotel, Minsterley, Shropshire.
132 R.N.—Miss Muriel Mill, Thongsleigh, Cruwys, Morchard, Tiverton.
H.C.—170. C.—174, 179.

FLOWER SHOW.

Class 1.—*Groups of Miscellaneous Plants.*

1 I. (£40).—James Cypher & Sons, Ltd., Queen's Road Nurseries, Cheltenham.
3 II. (£30).—T. M. Petch, Highfield Nurseries, Poplar Grove, Great Horton, Bradford.

Class 2.—*Collections of Delphiniums.*

(No Entry.)

Class 3.—*Groups of Tuberous Begonias in pots.*

4 I. (£20).—Blackmore & Langdon, Bath.
5 II. (£15).—H. Woolman, Shirley, Birmingham.

Class 4.—*Groups of Aquatic and Semi-Aquatic Plants.*

7 I. (£20).—Hillier & Sons, West Hill Nurseries, Winchester.
9 II. (£15).—Stephen Sims, Draycott, Derbyshire.
8 III. (£10).—M. Prichard & Sons, Ltd., Riverslea Nurseries, Christchurch, Hants.
6 IV. (£5).—Lt.-Col. C. H. Grey, D.S.O., Hocken Edge Gardens, Cranbrook.

Class 5.—*Collections of Hardy Perennial Plants and Cut Blooms.*

10 I. (£30).—Bees, Ltd., Sealand Nurseries, Chester.
12 II. (£25).—Suffolk Seed Stores, Ltd., Woodbridge.
11 III. (£20).—Rich & Cooling, Ltd., 2, Walcot Street, Bath.

Class 6.—*Collection of Tree Carnations.*

13 I. (£15 & Cup).[1]—C. Engelmann, Ltd., Saffron Walden.
14 II. (£10).—Stuart Low & Co., Bush Hill Park, Enfield.

Class 7.—*Collections of Cut Sprays of Border Carnations.*

15 I. (£15).—Horace Lakeman, Queensberry Nursery, Thornton Heath.

Class 8.—*Collections of Sweet Peas.*

16 I. (£15).—G. H. Brookshaw, Stock Lane, Hough, Crewe.

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[1] Perpetual Challenge Cup awarded to Winner of First Prize in Class 6.

Class 9.—*Collections of Cut Roses.*

18 I. (£15).—G. Gregory, Old Close Nurseries, Chilwell, Nottingham.
19 II. (£10).—Jarman & Co., Chard, Somerset.
20 III. (£7).—Thos. Robinson, Porchester Nurseries, Nottingham.

Class 10.—*Groups of Cannas.*

21 II. (£5).—Stuart Low & Co., Bush Hill Park, Enfield.

Exhibits not for Competition.

Large Gold Medals to :—

22 Allwood Bros., Wivelsfield Nurseries, Haywards Heath. Carnations.
27a Blackmore & Langdon, Bath. Delphiniums and Gloxinias.
33 Conways, Ltd., Halifax. Rock and Water Garden.
36 Alex. Dickson & Sons, Ltd., Hawlmark, Marks Tey, Essex. Roses.
72 Studley College, Studley, Warwickshire. Fruits and Vegetables.
73 Sutton & Sons, Ltd., Reading. Sweet Peas.
74 Toogood & Sons, Ltd., Southampton. Vegetables.

Gold Medals to :—

26 Bees, Ltd., Sealand Nurseries, Chester. Hardy Flowers, mostly Delphiniums.
29 Mrs. R. G. Burden, Clevedon Hall, Somerset. Crotons, Acalyphas, Liliums, Begonias, Humeas, Spireas, Ferns, Orchids, etc.
31 Frank Cant & Co., Ltd., Braiswick Rose Gardens, Colchester. Roses.
42 Lt.-Col. C. H. Grey, D.S.O., Hocker Edge Gardens, Cranbrook. Lilies and other bulbous plants.
46 Hillier & Sons, West Hill Nurseries, Winchester. Flowering Trees, Shrubs and Plants.
56 Stuart Low & Co., Bush Hill Park, Enfield. Orchids.
57 William Lowe & Son (Nurseries), Ltd., Beeston, Notts. Cut Roses.
61 John Peed & Son, West Norwood, London, S.E.27. Stove and Greenhouse Plants.
65 Luke Rogers & Sons, 101, Whiteladies Road, Bristol. Rock and Water Garden.
68 L. R. Russell, Ltd., Richmond Nurseries, Windlesham, Surrey. Hardy and Half-Hardy Shrubs and Aquatics.
75 Edward Webb & Sons (Stourbridge), Ltd., Wordsley, Stourbridge. Sweet Peas and Annuals.
78 H. G. Alexander, Ltd., Westonbirt, Tetbury. Orchids.

Silver Gilt Medals to :—

24 Major C. A. Baker, White House Gardens, Llanfoist, Abergavenny. Alpine and Rock Plants.
30 Benjamin R. Cant & Sons, Ltd., The Old Rose Gardens, Colchester. Cut Roses.
35 Daniels Bros., Ltd., Norwich. Lilies, Gladioli, Perennials, etc.
38 Forest and Orchard Nurseries, Ltd., Milbury Heath, Fulfield. Ornamental and Flowering Trees and Shrubs, etc.
40 Gayborder Nurseries, Ltd., Melbourne, Derbyshire. Herbaceous Plants.
50 John Jefferies & Son, Ltd., The Royal Nurseries, Cirencester. Shrubs and Alpine Plants in Rock Garden with Pool.
53 Horace Lakeman, Queensberry Nursery, Thornton Heath. Cut Sprays of Border Carnations.
58 Maxwell & Beale, Ltd., Broadstone, Dorset. Miniature Rock and Heath Garden.
71 J. F. Spencer & Son, Hockley, Essex. Dahlias.

Silver Medals to :—

23 Alpine Nurseries, Ltd., West Moors, Wimborne. Rock and Alpine Plants.
48 W. Hopwood & Son, 58, High Street, Cheltenham. Cut Blooms of Herbaceous Plants.
51 Kelway & Son (1933), Ltd., Langport, Somerset. Cut Flowers.
62 M. Prichard & Sons, Ltd., Riverslea Nurseries, Christchurch, Hants. Herbaceous Plants.
64 F. Rich, Hindlip Nurseries, Worcester. Hardy Cut Flowers.
80 W. G. Hoskins & Sons, Coy Pond Nurseries, Bournemouth West. Clematis and Climbers.

IMPLEMENTS.

Silver Medals for Articles entered as "New Implements for Agricultural or Estate Purposes."

111 Allis-Chalmers Manufacturing Co., 728, Salisbury House, London Wall, London, E.C.2. All-Crop Harvester.
903 A. C. Bamlett, Ltd., Thirsk, Yorks. One-horse motor-driven Mower.

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(*The name of the donor, or the mode of acquisition, appears in italics after the title of each work.*)

Agricultural Economics Research Institute. The History of Milk Prices. An Analysis of the Factors affecting the Prices of Milk and Milk Products. By Ruth L. Cohen. Oxford, 1936 . . . . *Institute*

——— Studies in Power Farming. I. Mechanized Corn Growing. By A. Bridges and H. Whitby; II. The Cost of Tractor Work. By J. R. Lee. Oxford, 1936 . . *Institute*

——— The Agricultural Register, 1935–36. Oxford, 1936 *Institute*

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British Standards Institution. B.S. Specification for Floating Dairy Thermometers. No. 695, July, 1936 . *Institution*

——— B.S. Apparatus and Methods for determining the percentage of Fat in Milk and Milk Products by the Gerber Method. Part I.—Apparatus; Part II.—Methods. No. 696, August, 1936 . . . . *Institution*

Canada Year Book, 1936 . . . . . . *Dominion Govt.*

Central Landowners' Association. The Agricultural Landowner's Handbook on Taxation (Taxes, Rates, Tithe, Death Duties, Stamp and Licence Duties, etc.). 5th ed., rev. and enl. November, 1936. By R. Strachan Gardiner *Association*

Cobbett, William. The Progress of a Plough-boy to a Seat in Parliament, as exemplified in the History of the Life of William Cobbett, Member of Parliament for Oldham. Edited by William Reitzel. London, 1933 . . . . *Purchased*

Davies, W. L. The Chemistry of Milk. London, 1936 . *Purchased*

Defries, A. The Book of the Mushroom. London, 1936 *Purchased*

Eckles, C. H., W. B. Combs, and Harold Macy. Milk and Milk Products. 2nd ed. New York and London, 1936 . *Publishers*

Ernle, Lord. English Farming Past and Present. 5th ed. By Sir A. Daniel Hall. London, 1936 . . . . . *Purchased*

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Imperial Economic Committee. Fruit Supplies in 1935 . *Purchased*

——— Dairy Supplies, 1935 (including Poultry and Pig Products) . . . . *Purchased*

——— Meat. A Summary of Figures of Production and Trade relating to Beef, Mutton, Lamb, Bacon and Hams, Pork, Cattle, Sheep, Pigs, Canned Meat. London, 1936 *Purchased*

——— Fruit. A Summary of Figures of Production and Trade relating to Apples, Pears, Bananas, Citrus Fruit, Grapes, Wine, Raisins and Currants, Canned Fruits. London, 1936 . . . . *Purchased*

——— Vegetable Oils and Oilseeds. A Summary of Production and Trade relating to Cottonseed, Linseed, Rapeseed, Sesame Seed, Soya Beans, Ground Nuts, Copra, Palm Kernels, Palm Oil and Olive Oil. London, 1936 . *Purchased*

——— Dairy Produce. A Summary of Figures of Production and Trade relating to Butter, Cheese, Preserved Milk, Eggs, Egg Products. London, 1936 . . . . . . *Purchased*

——— Wool Production and Trade, 1935–36. London, 1936 *Purchased*

——— Industrial Fibres. A Summary of Figures of Production, Trade and Consumption relating to Cotton, Wool, Silk, Flax, Jute, Hemp and Rayon. London, 1936 . *Purchased*

Institute for Research in Agricultural Engineering. Farm and Machine, Vols. I. and III. Oxford, 1934 and 1936 *Purchased*

——— Refrigeration for the Farm and Dairy. By C. A. Cameron Brown. Oxford, 1936 . . . . . *Institute*

Journal of Agricultural Science. Vol. XXVI., 1936 . *Purchased*

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Ministry of Agriculture and Fisheries. Bulletins No. 76, Herbs; No 85, Rotation of Crops; No. 90, Allotments; No. 92, Chrysanthemums; No. 96, Commercial Flower Production, Part I.; No. 99, Insect Pests of Crops, 1932–34; No. 101, Methods of Hedge and Tree Stump Clearing; No. 102, The Cultivation and Harvesting of Sugar Beet on the Continent.—By F. Rayns and S. J. Wright . . . *H.M.S.O.*

——— The Land Drainage Act, 1930, Handbook . . *H.M.S.O.*

——— Mechanization of Agriculture. Fourth Selected Bibliography (References in the Ministry's Library). Fol. Typescript, 1936 . . . . *Ministry*

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